DECelms

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Order Number: AA–PAK2A–TE

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June 1990

This manual describes how to use DECelms (DEC Extended LAN Management Software) to configure, manage, and monitor the LAN Bridge 100, LAN Bridge 150, LAN Bridge 200, DECbridge 500, and DECconcentrator.

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Preface

This manual describes how to use DECelms (DEC Extended LAN Management Software) to configure, monitor, and control the LAN Bridge 100, LAN Bridge 150, LAN Bridge 200, DECbridge 500, and DECconcentrator 500.

Intended Audience

This manual is for anyone responsible for planning, configuring, managing, and monitoring the bridges and wiring concentrators in an extended local area network (LAN).

Document Structure

This manual consists of six chapters, three appendixes, and a glossary, which explain how to use DECelms to manage the bridges and wiring concentrators on an extended LAN.

Chapter 1	Introduces DECelms, describes how to set up the DECelms registry, and explains how to begin using DECelms.
Chapter 2	Describes how to manage and configure the devices on an extended LAN.
Chapter 3	Presents the management of lines and physical ports on bridges and wiring concentrators.
Chapter 4	Explains how to use DECelms to control address and protocol filtering on bridges.

Chapter 5	Explains how to monitor bridges and wiring concentrators and describes all of the attributes that DECelms displays. Also describes how to display SMT information for FDDI stations.
Chapter 6	Provides examples of using DECelms and related tools to troubleshoot the most prevalent extended LAN problems.
Appendix A	Describes the DECelms event codes.
Appendix B	Lists the DECelms error and informational messages, along with explanations and corrective actions.
Appendix C	Lists protocol values that you can use to implement protocol filtering on a bridge.
Appendix D	Presents the algorithms used by the LAN Bridge 200 Line Monitor.
Glossary	Defines terms used in the manual.

The postage-prepaid Reader's Comments form on the last page of this manual is for your critical evaluation to assist us in preparing future documentation.

Related Documentation

You can find additional information in the following documents:

- *DECelms Installation*

  Explains how to install DECelms.

- *DECelms Reference*

  Provides alphabetical reference descriptions of the DECelms commands.

- *Bridge and Extended LAN Reference*

  Presents conceptual information on bridge operation, configuration, management, and troubleshooting.

- *FDDI System Level Description*

  Outlines the FDDI standard and Digital's implementation of the standard. Also describes the operation of FDDI adapters, bridges, and wiring concentrators.

- DECelms Release Notes (on line)

  Provide information and updates that are not included in the DECelms manuals. The release notes are delivered on line as part of the software distribution kit.

- DECelms Help Text (on line)

  A menu-oriented description of the DECelms commands. This information is available at both the DCL prompt ($) and within DECelms.

Conventions Used in This Manual

The following conventions are used in this manual:

Convention	Meaning
`Special Type`	This special type indicates examples of system output or user input. System output is in black type; user input is in red type.
UPPERCASE	Uppercase letters in commands and examples indicate that you should enter the exact characters shown. However, you may enter them in either uppercase or lowercase.
lowercase italics	Lowercase italics in commands and examples indicate variables for which either the user or the system supplies a value.
[ ]	Brackets in command lines indicate that the enclosed value or values are optional. If there is more than one option, you can choose only one of the options. Do not type the brackets when you enter the command.
{ }	Braces indicate that the enclosed text is required and you **must** choose only one of the options. Do not type the braces when you enter the command.
" "	You must include the quotation marks that enclose character strings in commands.
$\boxed{key}$	Indicates that you must press the specified key. $\boxed{\text{Ctrl}/x}$ indicates that you hold down $\boxed{\text{Ctrl}}$ while you press the *x* key, where *x* is a letter. Note that, unless otherwise specified, you terminate every command by pressing $\boxed{\text{Return}}$.

1

Getting Started with DECelms

This chapter introduces DECelms (DEC Extended LAN Management Software) describes how to use the software, and explains how to control the DECelms registry, the DECelms error log, and the display of event messages. Once you learn the material in this chapter, you can use DECelms to manage the bridges and wiring concentrators in your extended local area network (LAN), as described in the subsequent chapters of this manual. This chapter covers the following:

- DECelms Overview
- Privileges Required to Use DECelms
- Invoking DECelms
- Getting Help
- Using DECelms
- Terminating DECelms
- Using Command Files of DECelms Commands
- The DECelms Screen Display
- DECelms Entities
- The DECelms Command Domain
- The DECelms Registry
- The DECelms Event Log
- Controlling the Display of Event Messages

1.1 DECelms Overview

DECelms (DEC Extended LAN Management Software) is a VMS layered product that runs on a VAX or MicroVAX host computer (see the System Software Addendum for the acceptable configurations). You can use DECelms to monitor and control the following devices:

- LAN Bridge 100
- LAN Bridge 150
- LAN Bridge 200
- DECbridge 500
- DECconcentrator 500

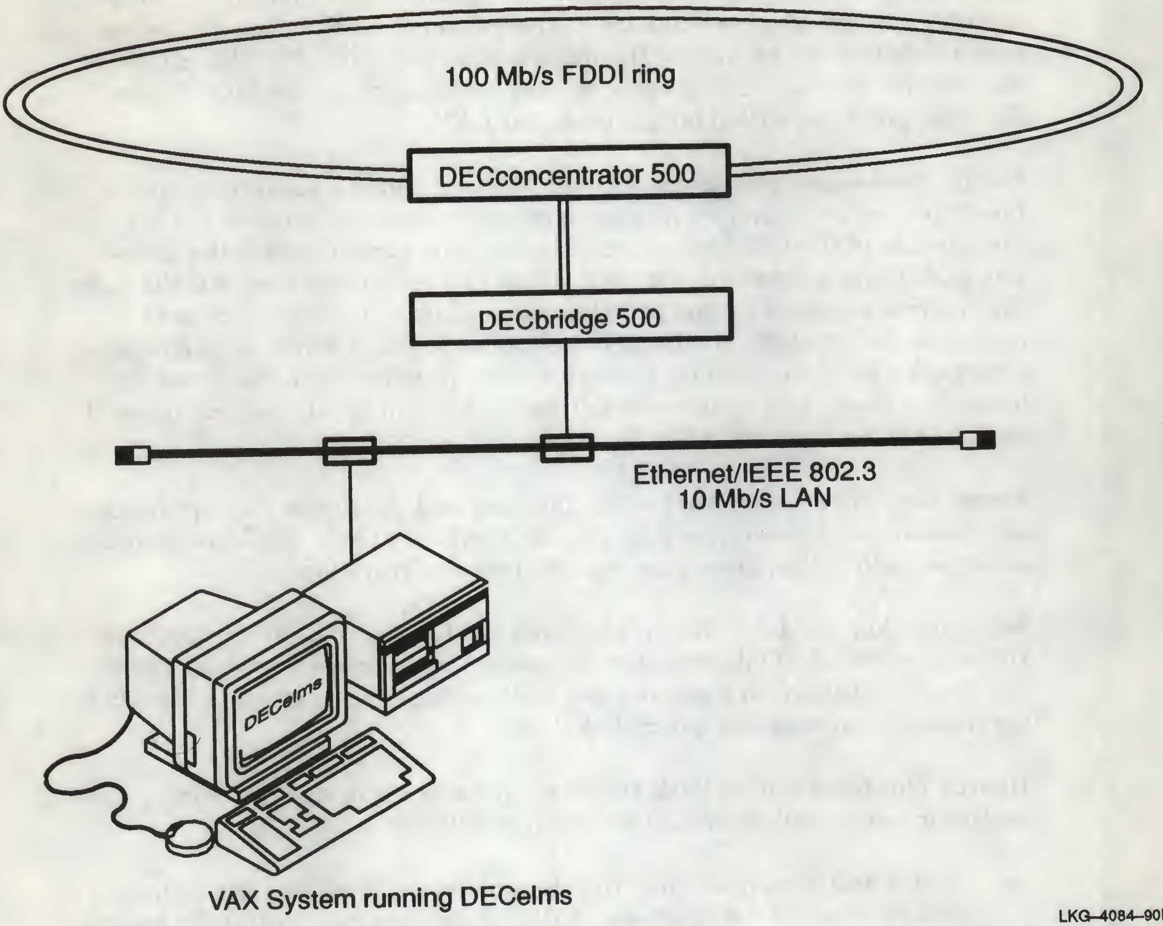
Using any DECconcentrator 500 as an intermediary, you can display configuration and operation information for any station that complies with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1. You can also display a map of the FDDI ring.

DECelms manages the devices in any extended LAN that contains segments or rings that use Ethernet, IEEE 802.3, or FDDI at the Physical and Data Link layers of the ISO/OSI reference model. The protocols used at the higher layers are irrelevant. However, the host system running DECelms must be attached to an Ethernet or IEEE 802.3 segment, as shown in Figure 1–1.

The DECelms software on the host communicates with the corresponding management software on the bridges and wiring concentrators, allowing you to remotely configure, manage, and monitor the devices in the extended LAN.

You can use bridges without DECelms, since bridges are autoconfiguring and the hardware switches provide the minimal management functions. However, DECelms greatly increases your ability to configure, manage, and monitor your bridges, and gives you access to the full functionality of the bridge. Likewise, DECelms provides remote management of wiring concentrators and enhances your management ability. The following paragraphs describe some of the benefits of DECelms.

Figure 1–1: DECelms System in the Extended LAN Topology



Device Naming: DECelms allows you to give bridges and wiring concentrators easy-to-remember ASCII names that you can use in commands instead of cumbersome hardware addresses.

Autoconfiguring Device Registry: The DECelms registry stores information about each bridge and wiring concentrator in the extended LAN: its device type, address or addresses, name, and a short description. You can run the DECelms device listener function to collect this information automatically as new devices come up on the extended LAN, or use DECelms commands to enter or modify the information manually. The DECelms device listener function detects new devices by listening to the MOP System ID messages transmitted on the extended LAN.

Event Messages: The device listener function and the background poller function send error and event messages to the message window, the bottom portion of the DECelms screen display. The background poller function maintains a database of device states and recognizes events if the state information returned by the polled device is different. When it detects a change in device state, the background poller function sends an event message to the message window, places an event description in the event log (described next), and updates its database. You can set the polling interval used by the background poller function.

Event Log: The background poller function and the device listener function also record event descriptions in the DECelms event log. DECelms provides a simple facility that generates reports from the event log.

Security: For the LAN Bridge 150, LAN Bridge 200, DECbridge 500 and DECconcentrator 500 devices, you can assign a password to protect the device from unauthorized configuration and control. The password is stored in the device's nonvolatile memory (NVRAM).

Device Configuration: With DECelms you can set bridge and wiring concentrator configuration characteristics remotely.

- Bridge and Line Spanning Tree Parameters—By setting the spanning tree parameters for bridges and their lines, you can control the logical layout and performance of your extended LAN. The spanning tree parameter values you enter are stored in the bridge's NVRAM. You can also reset a bridge's spanning tree parameters to the factory default values with a single command.
- LAN Traffic Monitor (LTM) Listener—DECelms enables you to remotely control whether a LAN Bridge 100 or a LAN Bridge 150 will serve as a bridge or as an LTM listener. DECelms sets a software switch that controls whether the bridge will request a down-line load of LTM software upon initialization, as described next.

- Software Down-Line Loading—DECelms can control whether a LAN Bridge 100, LAN Bridge 150, or LAN Bridge 200 will request a down-line load of software upon initialization, and sets the host to which the bridge will send the request.
- Firmware Upgrade Down-Line Loading—DECelms allows you to remotely control whether a DECbridge 500 or DECconcentrator 500 will accept down-line loaded firmware upgrades.
- Up-Line Dumping—DECelms can configure a LAN Bridge 200, DECbridge 500, or DECconcentrator 500 for up-line dumping so that the device up-line dumps its memory and register contents if it encounters a fatal error.
- IP Fragmentation—DECelms controls whether a DECbridge 500 will break large Internet Protocol (IP) frames received on its FDDI line into smaller frames that can be transmitted on its Ethernet/IEEE 802.3 line. This fragmentation is necessary because the maximum legal data size for a frame on an FDDI ring is 4500 octets, but only 1518 octets for an Ethernet/IEEE 802.3 segment. The bridge does not fragment frames containing other protocols.

Device Initialization: DECelms allows you to initialize a device, which forces the device to run its self-test sequence and resets its counters to zero. Upon initialization, bridges also perform the spanning tree computation process and learn the addresses of the stations on their LANs.

Enabling and Disabling Lines: DECelms enables and disables the Ethernet/IEEE 802.3 and FDDI lines on bridges. This controls the outcome of the spanning tree computation process by determining which bridges are active and which bridges are on standby (backup bridges). (The MAC entity of the line is not affected.)

Line Configuration: For Ethernet/IEEE 802.3 lines on bridges, you can use DECelms to inform the bridge whether the transceiver on the line uses the Collision Presence Test (CPT) characteristic. For the FDDI line on bridges and wiring concentrators, DECelms can set the requested token rotation time (the ANSI FDDI parameter T_Req), the maximum token rotation time (the ANSI FDDI parameter T_Max), and the valid transmission time (the ANSI FDDI parameter TVX).

Physical Port Configuration and Control: DECelms enables and disables the physical ports on DECbridge 500 models. You can also set the link error monitor (LEM) threshold for physical ports on DECbridge 500 and DECconcentrator 500 models.

Address Filtering: DECelms allows you to add address entries to the forwarding database of a bridge. These entries are stored in NVRAM if there is enough room. All bridge models filter frames based on the destination address, but the LAN Bridge 200 and DECbridge 500 models also filter frames based on the source address. You can use address filtering to block certain stations from receiving or sending frames across a bridge and thus localize traffic.

For LAN Bridge 200 models, you can use DECelms to implement an alternative form of filtering, **selective address forwarding**, where the bridge forwards only frames with source and destination addresses that have entries set to FORWARD. Thus you can block general access and allow only certain stations to communicate across the bridge.

Protocol Filtering: On LAN Bridge 200 and DECbridge 500 models, you can add entries to the protocol database of a bridge, instructing the bridge to forward or filter (discard) frames based on the protocol information in the frame. You can prevent the bridge from forwarding Ethernet, IEEE 802.3, and IEEE 802.2 SNAP frames that contain certain protocols, thus regionalizing traffic or isolating broadcast storms and other protocol-related problems. Alternatively, you can implement **selective protocol forwarding**, where you block general access and allow only certain protocols to cross the bridge.

Device Monitoring: With DECelms, you can display the status, characteristics, and counters of the following entities:

- Bridges
- Wiring Concentrators
- Bridge Ethernet/IEEE 802.3 Lines
- Bridge or Wiring Concentrator FDDI Lines (the FDDI MAC Entity)
- DECbridge 500 and DECconcentrator 500 Physical Ports (the FDDI PHY and PMD Entities)

For bridges and bridge lines, you can also display the spanning tree parameter settings and the outcome of the spanning tree computation process.

LAN Monitoring: Using DECelms, you can access the LAN Bridge 200 Line Monitor, which allows you to monitor the LAN attached to the line. The line monitor presents four screen displays:

- Network Traffic Summary Display
- Current LAN Utilization and Throughput Statistics
- Long-Term LAN Utilization and Throughput Statistics
- Peak LAN Utilization and Throughput

These screen displays also show the percentage of multicast frames on the LAN.

Displaying SIF Information for FDDI Stations: Using a DECconcentrator 500 as an intermediary, you can display Status Information Frame (SIF) Configuration and Operation information from any station that complies with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1.

FDDI Ring Mapping: Using a DECconcentrator 500 as an intermediary, DECelms displays a logical map of the devices in the FDDI ring, showing the names, station types, station IDs, MAC addresses, active physical ports (for wiring concentrators), and connections of the stations on the ring.

Troubleshooting: DECelms gives you access to an enormous amount of network performance and error information, allowing you to diagnose and correct many common problems.

1.2 Privileges Required to Use DECelms

To use DECelms, you must have the following VMS privilege:

- TMPMBX—The ability to create a temporary mailbox

The *DECelms Installation* manual contains the procedure for assigning users this privilege.

NOTE

There may be an access control list (ACL) on your system that specifies the users who can use DECelms and lists their privileges. Contact the system manager if you find that

an ACL limits or prevents you from using DECelms, or modify the ACL yourself if you have the appropriate privileges. For more information about ACLs, see the *DECelms Installation* manual and the VMS documentation.

The use of DECelms can be further restricted with DECelms privilege modes and bridge passwords for certain bridge models, which are described in Section 1.2.1 and Section 1.2.2.

1.2.1 DECelms Privilege Modes

If the system manager has added the ELMS$RIGHTS_ID rights identifier to your system, DECelms has a **privileged mode** and a **nonprivileged mode**. Privileged users can use all DECelms commands, whereas nonprivileged users can use only the SHOW, LIST, and MONITOR commands, along with the commands that control the DECelms registry and DECelms itself. Thus, privileged users can control device configuration and operation, whereas nonprivileged users can only monitor device status and control the operation of DECelms itself.

Your privilege mode is determined by the privilege associated with your DECelms process. To be a privileged user, you must have the ELMS$RIGHTS_ID rights identifier associated with your DECelms process in addition to the TMPMBX privilege. (See the *DECelms Installation* manual for information on how to add the ELMS$RIGHTS_ID rights identifier to the system and grant it to users.)

1.2.2 Device Passwords

LAN Bridge 150, LAN Bridge 200, DECbridge 500, and DECconcentrator 500 devices can be protected by a password stored in their nonvolatile memory (NVRAM). These devices come from the factory without a password set. The DECelms command SET NEW PASSWORD sets the password for a device that does not have one set or modifies an existing password. Since you must supply the old password (if any) when setting a new one, you must clear the device's NVRAM if you forget the password. A hardware switch on the device clears the NVRAM and deletes the password. Refer to the device hardware documentation for more information on this switch.

You must supply the password with each DECelms command that configures or controls a LAN Bridge 150, LAN Bridge 200, DECbridge 500, or DECconcentrator 500 that has a password set. You must also supply the password when configuring or controlling the lines, physical ports, forwarding database, or protocol database on one of these devices. If the password that you enter does not match the one stored in the target device's memory, if any, the device rejects the command. You must enter a device password when using the following DECelms commands to control a device:

ADD
DISABLE
ENABLE
INITIALIZE
REMOVE
SET

1.3 Invoking DECelms

To invoke DECelms, enter ELMS_LAN_MANAGEMENT at the DCL prompt ($), as shown here. You can also use the abbreviation ELMS.

```
$ ELMS_LAN_MANAGEMENT
```

DECelms displays the following prompt:

```
ELMS>
```

As a shortcut, you can also include a DECelms command on the same command line that invokes the program. For example, the following command invokes DECelms and displays the status of the bridge BACKBONE:

```
$ ELMS_LAN_MANAGEMENT SHOW BACKBONE STATUS
```

When the command is completed, you are returned to the DCL prompt.

1.4 Getting Help

Help on DECelms is available from the DCL command line. To use this help, enter HELP ELMS_LAN_MANAGEMENT at the DCL prompt:

```
$ HELP ELMS_LAN_MANAGEMENT
```

The same help is available within DECelms. To display a general help message and a menu of topics for which help is available, enter HELP at the DECelms prompt:

```
ELMS> HELP

  Information available:

  ADD          DELETE     DISABLE    ENABLE     EXIT     FORMAT   HELP
  INITIALIZE   LIST       MESSAGES   MODIFY     MONITOR  REGISTER
  RELEASE_NOTES           REMOVE     SET        SHOW     START    STOP
  USE

Topic?
```

To display help on a specific DECelms command, enter HELP followed by the command name:

```
ELMS> HELP INITIALIZE
```

If there is more than one screen of text for a topic, DECelms prompts you to press Return for more. Press Return to continue the display, or press Ctrl/Z to return to the DECelms prompt.

1.5 Using DECelms

This section explains how to enter DECelms commands.

1.5.1 Entering Commands

To enter a DECelms command, type the command with any options or arguments and then press Return.

1.5.2 Command Abbreviations

You can generally abbreviate command keywords to the first three characters or the minimum number of characters necessary to identify them uniquely. For example, you could enter the command SHOW CHARACTERISTICS as:

```
ELMS> SHO CHA
```

1.5.3 Command Line Recall

DECelms offers a command line recall capability similar to the one available at the DCL command line. At the DECelms prompt, press the up arrow key (⇑) to go back through the previously entered DECelms commands. DECelms displays a prior command each time you press ⇑. Press the down arrow key (⇓) to move forward through the sequence of commands. Press Return when you see the command that you want to use.

1.5.4 Aborting a Command

To abort your current command and return to the DCL prompt, press Ctrl/Z. When you are using the DECelms display window, you can enter EXIT to stop a display and return to the DECelms prompt.

1.6 Terminating DECelms

To terminate DECelms and return to the DCL prompt, enter the EXIT command:

```
ELMS> EXIT
$
```

Pressing Ctrl/Y also terminates DECelms.

1.7 Using Command Files of DECelms Commands

You might find it convenient to automate some of your extended LAN management tasks by creating command files of DECelms commands. From the DCL command line, use an editor to create a text file of DECelms commands. Digital recommends that you use the default extension of .COM so that you can easily recognize your command files, but any extension is acceptable.

The following example shows a command file named DEVICECHECK.COM. This command file checks the status of each device in the extended LAN and files the information in subsequent versions of a file named DEVICE.STAT.

```
STOP ECHO
SHOW BACKBONE STATUS TO DEVICE.STAT
SHOW CLAVICLE STATUS TO DEVICE.STAT
SHOW SCAPULA STATUS TO DEVICE.STAT
SHOW PELVIS STATUS TO DEVICE.STAT
SHOW FEMUR STATUS TO DEVICE.STAT
```

To execute the command file, enter it at the DECelms command line preceded by the @ character. For example:

```
$ ELMS_LAN_MANAGER
ELMS> @DEVICECHECK.COM
ELMS> EXIT
$
```

1.7.1 Enabling and Disabling Command Echoing

To disable command echoing when you execute a DECelms command file, place STOP ECHO at the beginning of the command file. To reenable command echoing, use the START ECHO command.

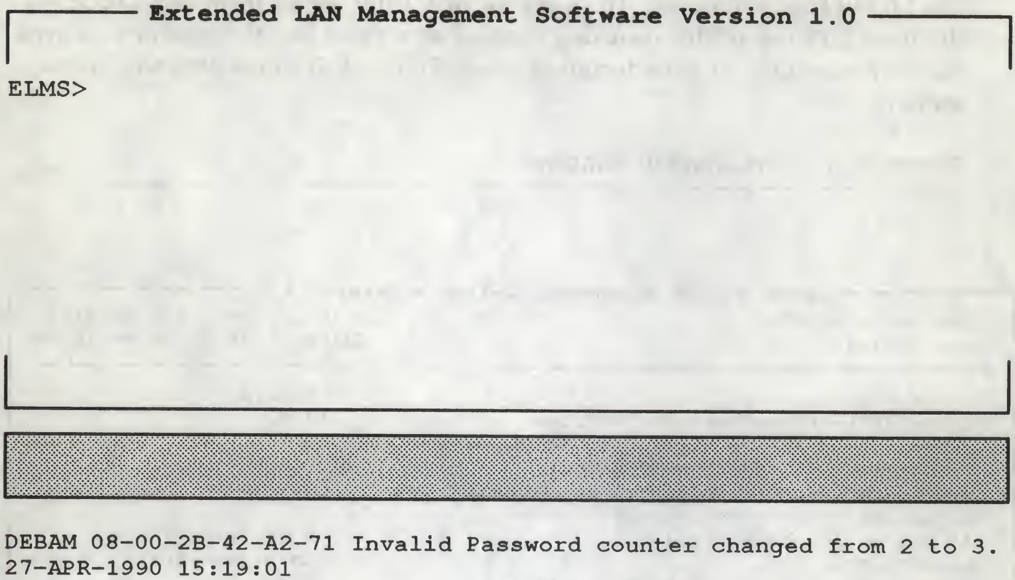
1.8 The DECelms Screen Display

This section describes the DECelms screen display, which is illustrated in Figure 1–2 and Figure 1–3. The display always has the product name on the top and the message window on the bottom. The middle area contains either the command window or the display window, depending on the current command. The following sections describe each part of the DECelms screen display.

1.8.1 The Command Window

The DECelms screen display contains the command window when you first invoke the program and at all other times except when you have entered one of the SHOW commands, the MONITOR command, the LIST command, or the MESSAGES command. Figure 1–2 illustrates the command window. In the command window, DECelms displays prompts, the commands that you enter, DECelms informational messages, and syntax error messages.

Figure 1–2: The Command Window



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1.8.2 The Display Window

The DECelms screen contains the display window when you enter one of the SHOW commands, the LIST command, the MESSAGES command, or the MONITOR command. On a standard VT100 series terminal, DECelms displays 20 lines of the resulting display at a time, but the size of this area varies depending on your terminal type. Figure 1–3 illustrates the display window.

Figure 1–3: The Display Window

```
             Extended LAN Management Software Version 1.0
Show Device Status                              As of: 27-APR-1990 12:37:12
Name: DEBAM                                    Address: 08-00-2B-OF-32-CE

Device State:                                         OPERATE
Current Forwarding Database Entries:                  1429
Current Non-volatile Forwarding Database Entries:     0
Current Protocol Database Entries:                    1
Current Non-volatile Protocol Database Entries:       1
Management Request Heard Port:                        1
LAN Bridge 100 Being Polled:                          08-00-2B-0C-1E-3A
Spanning Tree Mode:                                   LAN Bridge 100
Inactive Forwarding Database Entries:                 1337
Time Since Forwarding Database Purged:                1820547
Device Broken Reason:                                 Operational F/W failure
NVRAM Failed Flag:                                    False
Time Since Last Hello Sent:                           0
Device Configuration:                                 N/A

 <CR>      EXIT  Up_arw  Prev_scr  Dn_arw  Next_scr  File     Search

DEBAM 08-00-2B-42-A2-71 Invalid Password counter changed from 2 to 3.
14-MAR-1990 15:19:01
```

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The command bar, the shaded area near the bottom of the screen just above the message window, shows the commands available within the display window. Highlighting within the command bar shows the commands that are available in the current display. Table 1–1 describes the display window commands.

Table 1–1: Display Window Commands

<CR>	Pressing Return places the next display in the display window. For example, when you enter SHOW KNOWN BRIDGES STATUS, pressing Return places the status display for the next bridge in the display window. When you are viewing a display that contains a single screen or when you are viewing the last screen in a multi-screen display, pressing Return erases the display window and returns you to the command window.
EXIT	Typing EXIT erases the display window and returns you to the command window. Pressing Ctrl/Z or F10 performs the same function.
Up_arw	Pressing the up arrow key (↑) scrolls backwards through the display one line at a time.
Prev_scr	Pressing Prev Screen shows the previous screen of the display, leaving two of the current lines so that you can remember the context. The size of the screen depends on your terminal type.
Dn_arw	Pressing the down arrow key (↓) scrolls forward through the display one line at a time.
Next_scr	Pressing Next Screen shows the next screen of the display, leaving two of the current lines so that you can remember the context. The size of the screen depends on your terminal type.
File	Typing FILE sends the entire display to a file. DECelms displays the FILE_SPEC> prompt for you to enter the file specification.
Search	Typing SEARCH finds the character string that you specify. When you enter this command, DECelms displays the Search> prompt. Type the string that you want to find and press Return. DECelms finds and highlights the first occurrence of the string starting from the top of the display, or displays a message if the string is not present. To find the next occurrence, press S Find or Find Find.

To refresh the screen display, press Ctrl/W or Ctrl/R. To obtain help on using DECelms, press Help.

1.8.3 The Message Window

The message window is a two-line area that is always present at the bottom of the DECelms screen. DECelms displays three types of messages in the message window, as described in the following paragraphs.

Event Messages: DECelms event message are generated by the background poller function when it detected a device state change, as described in Section 1.12.1. Event messages are also generated by the device listener function when it detects a new device transmitting on the extended LAN, as described in Section 1.11.2. The following is an example of an event message:

```
DEBAM 08-00-2B-42-A2-71 Invalid Password counter changed from 2 to 3.
27-APR-1990  12:48:57
```

The START ALARM and STOP ALARM commands, described in Section 1.13, instruct DECelms to start or stop displaying event messages in the message window.

Error Messages: The error messages displayed in the message window describe exception conditions or DECelms internal errors. DECelms displays user syntax error messages in the command window. The following is an example of an error message that DECelms displays in the message window:

```
Requested address not in forwarding database.
```

Broadcast Messages: DECelms displays operating system messages, operator console broadcasts, Mail utility notifications, and other unsolicited messages in the message window.

1.8.3.1 Displaying Messages

The MESSAGES command places the 128 most recent messages in the display window, where you can scroll through them, send them to a file, search for a string, and so on. DECelms updates the display as new messages arrive. An example of the MESSAGES command follows:

```
ELMS> MESSAGES

SHOW: ALARM/Message Window                    As of: 27-APR-1990 14:56:01

Device type incorrect for protocol operations.
DEBAM 08-00-2B-42-A2-71 Invalid Password counter changed from 2 to 3.
27-APR-1990  12:48:57
No Device Address was specified.
Requested value not in protocol database.
```

1.9 DECelms Entities

Using DECelms, you can manage the actual devices on the extended LAN, the entries in the DECelms registry, or the operation of the program itself. You do not need to establish the context before issuing a DECelms command, because the command verb itself establishes the context. For example, the REGISTER, MODIFY, DELETE, and LIST commands always affect the DECelms registry. This section describes the entities that you can monitor and control with DECelms: the actual devices on the extended LAN and the entries in the DECelms registry.

1.9.1 Device Entities

Table 1–2 describes the device entities that you can manage with DECelms: the actual bridges and wiring concentrators on the extended LAN, along with their lines and physical ports.

Table 1–2: Device Entities

bridge-id	Specifies the bridge to be affected by the command. The *bridge-id* can be either the bridge's name or its address. **Bridge Addresses:** Bridge addresses are 12 hexadecimal digits in the form *nn-nn-nn-nn-nn-nn*. A label on the back of a bridge shows its address or addresses. On LAN Bridge 100 models, the bridge address is a unique 48-bit hardware address that is assigned to the bridge during manufacturing. On LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, each of the two lines is assigned an address during manufacturing. Normally, you can use either line address to control the bridge with DECelms. However, if one of the lines is BROKEN or DISABLED, you must use the line address of the other line.

	For LAN Bridge 150 and LAN Bridge 200 models, the line address with the lower hexadecimal value serves as the address portion of the node identification used in the spanning tree computation process. For the DECbridge 500, the line address of the Ethernet/IEEE 802.3 line serves as the address portion of the node identification. **Bridge Names:** You cannot use a bridge name as the *bridge-id* until it is entered in the DECelms registry and associated with a bridge address. If it is enabled, the device listener function assigns each bridge a name based on its address; for example: NM_08002B2A4276. You can also assign the bridge name when manually adding an entry to the registry, or change the name assigned by the device listener function, as described in Section 1.11.5. Device names must be unique within the DECelms registry.
concentrator-id	Specifies the wiring concentrator to be affected by the command. The *concentrator-id* can be either the wiring concentrator's name or its 48-bit hardware address. The address is a unique hardware address that is assigned to the wiring concentrator during manufacturing. Figure 1–4 shows the location of the address label. Wiring concentrator addresses are 12 hexadecimal digits in the form *nn-nn-nn-nn-nn-nn.*

	You cannot use a wiring concentrator name as the *concentrator-id* until it is entered in the DECelms registry and associated with a wiring concentrator address. If it is enabled, the device listener function assigns each wiring concentrator a name based on its 48-bit hardware address; for example: NM_08002B3B3243. You can also assign the wiring concentrator name when manually adding an entry to the registry, or change the name assigned by the device listener function, as described in Section 1.11.5. Device names must be unique within the DECelms registry.
station-id	Specifies that the FDDI station with the given name or 48-bit address is to be affected. The address must be 12 hexadecimal digits in the form *nn-nn-nn-nn-nn-nn*. You cannot use a name for the station unless it is registered in the DECelms registry. Within DECelms, an FDDI station is any addressable device that complies with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1.
KNOWN BRIDGES	Specifies that all the bridges listed in the DECelms registry and able to respond to DECelms commands are to be affected.
KNOWN CONCENTRATORS	Specifies that all the wiring concentrators listed in the DECelms registry and able to respond to DECelms commands are to be affected.
KNOWN DEVICES	Specifies that all the bridges and wiring concentrators listed in the DECelms registry and able to respond to DECelms commands are to be affected.

LINE *line-number*	Specifies the line number on a bridge or wiring concentrator to be affected by the command; for example LINE 1. Do not confuse the line number with the line address (some bridge models have a separate address for each line). The line entity is defined differently for a bridge Ethernet/IEEE 802.3 line and an FDDI line on a DECbridge 500 or a DECconcentrator 500, as illustrated in Figure 1–5 and described in the following paragraphs. For an Ethernet/IEEE 802.3 line on a bridge, the line entity includes both the Media Access Control (MAC) function and the Physical layer of the ISO/OSI reference model. This includes the lower part of the Data Link layer (layer 2) and all of the Physical layer, as shown in Figure 1–5. Line numbers are automatically assigned by the bridge. The Ethernet/IEEE 802.3 lines on a LAN Bridge 100, LAN Bridge 150, or LAN Bridge 200 are numbered 1 and 2. The Ethernet/IEEE 802.3 line on DECbridge 500 is line 1. On a DECbridge 500 or a DECconcentrator 500, the FDDI line entity includes only the FDDI MAC of the device. The physical port entity contains the PHY and PMD functions of the FDDI model, as described below. On both the DECbridge 500 and the DECconcentrator 500, the FDDI line is line 1.
KNOWN LINES	Specifies that all the lines on a bridge are to be affected.
PHYPORT *phyport-id*	Specifies the physical port on a bridge or wiring concentrator to be affected by the command. A physical port is the PHY and PMD functions of the FDDI model, the Physical layer (layer 1) in the ISO/OSI reference model, as shown in Figure 1–5.

Table 1–2 (Cont.): Device Entities

	The physical port on a DECbridge 500 is physical port 1. The physical ports on a DECconcentrator 500 are labeled 1A through 4C, as shown in Figure 1–6. The letter indicates the board slot in the backplane; the number indicates the position of the physical port on the printed circuit board.
KNOWN PHYPORTS	Specifies that all the physical ports on a wiring concentrator are to be affected.

Figure 1–4: Hardware Address Label on a DECconcentrator 500

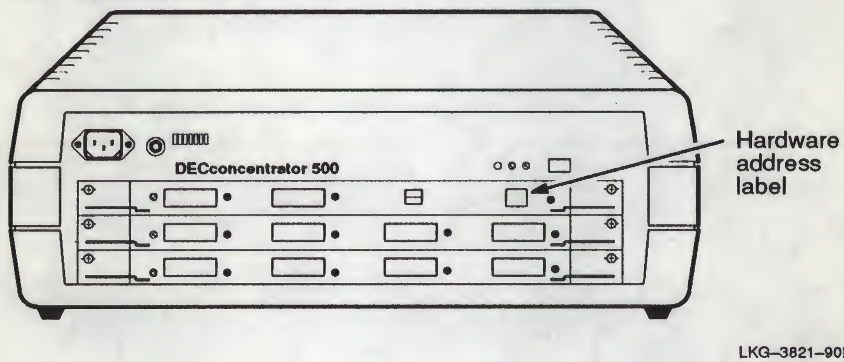


Figure 1–5: Meaning of the Line Entity for Ethernet/IEEE 802.3 and FDDI Lines

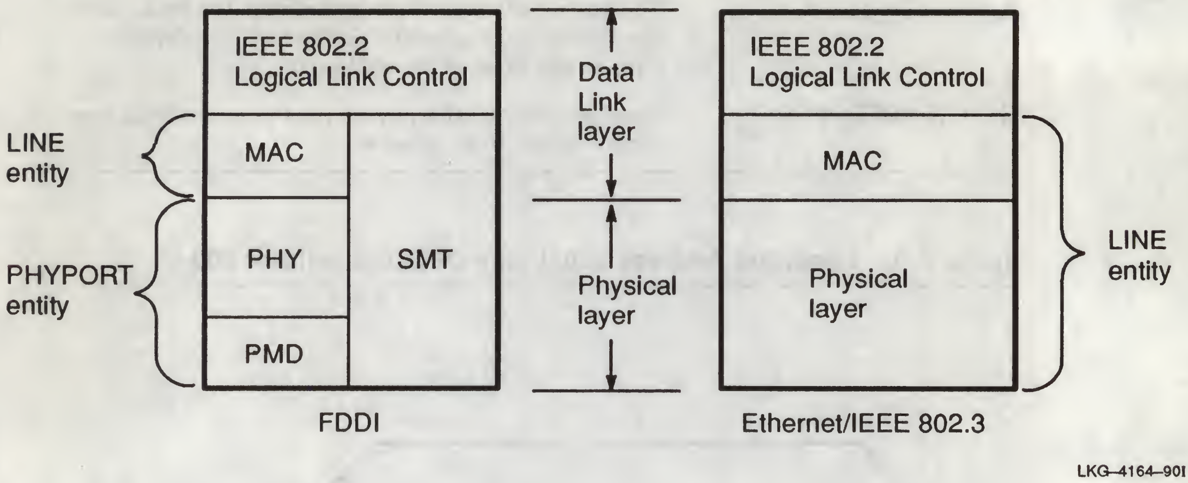
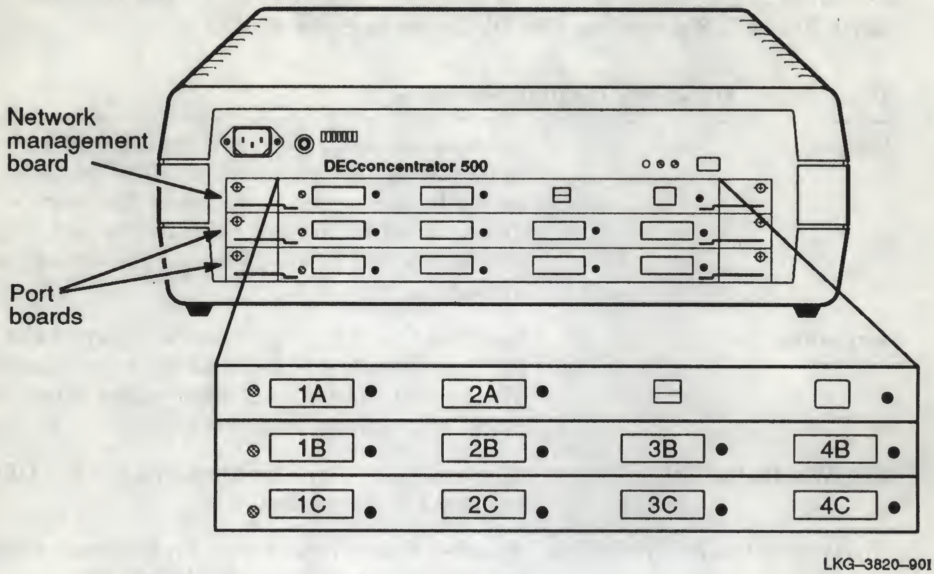


Figure 1–6: Physical Port Numbers on a DECconcentrator 500



1.9.2 DECelms Registry Entities

The REGISTER, MODIFY, DELETE, and LIST commands affect the device entries in the DECelms registry rather than the actual devices on the extended LAN. See Section 1.11 for more information on the DECelms registry. Table 1–3 describes the DECelms registry entities.

Table 1–3: DECelms Registry Entities

bridge-id	Specifies the bridge entry in the DECelms registry to be affected by the command. The *bridge-id* can be the bridge's name or its 48-bit hardware address. (For LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, you can use either line address.)
concentrator-id	Specifies the wiring concentrator entry in the DECelms registry to be affected by the command. The *concentrator-id* can be the wiring concentrator's name or its 48-bit hardware address.
KNOWN BRIDGES	Specifies that all the bridge entries in the DECelms registry are to be affected.
KNOWN CONCENTRATORS	Specifies that all the wiring concentrator entries in the DECelms registry are to be affected.
KNOWN DEVICES	Specifies that all the entries in the DECelms registry are to be affected.

1.10 The DECelms Command Domain

The DECelms **command domain** is the entity to which a DECelms command applies. An example of a command domain is KNOWN BRIDGES KNOWN LINES. You can set the command domain with the USE command or specify the command domain in the DECelms management command itself.

1.10.1 Setting the Default Command Domain with the USE Command

The USE command establishes the entity that subsequent DECelms device management commands affect. The domain set by the USE command is referred to as the **default domain**; it remains in effect until you change it with another USE command. For example, the following USE command establishes the bridge named CHAINBRIDGE as the default domain:

```
ELMS> USE CHAINBRIDGE
```

The following command further defines the default domain to be line 1 on the bridge CHAINBRIDGE:

```
ELMS> USE LINE 1
```

Both of these commands could be combined into a single USE command:

```
ELMS> USE CHAINBRIDGE LINE 1
```

Now that CHAINBRIDGE LINE 1 is the default domain, entering the SHOW STATUS command displays the status of line 1 on the bridge CHAINBRIDGE:

```
ELMS> SHOW STATUS
Line Status for Line 1 as of 27-APR-90 11:22:06
Bridge CHAINBRIDGE,  Address 08-00-2B-0C-1A-A7

Local Network Module State:          FORWARDING
Local Network Module Broken Reason:
```

The default domain remains in effect until you change it with another USE command. The USE command in the following example changes the default domain so that subsequent commands will apply to the wiring concentrator named MEDUSA:

```
ELMS> USE MEDUSA
```

The following USE command establishes KNOWN BRIDGES as the default domain, causing subsequent commands to affect every bridge that is listed in the DECelms registry.

```
ELMS> USE KNOWN BRIDGES
```

1.10.2 Specifying the Domain in a DECelms Management Command

You can also specify the entity in a DECelms management command. Each time you enter a command, the target entity is a combination of the entity information given in the management command itself and the entity that you gave in the previous USE command. For example, the following USE command establishes the bridge BUILDINGB as the default domain. The next command further defines the command domain, instructing DECelms to display the counters of line 2 on the bridge BUILDINGB.

```
ELMS> USE BUILDINGB
ELMS> SHOW LINE 2 COUNTERS
```

You can override the default domain by specifying a different domain in a DECelms management command. This does not change the default domain, however; only the USE command can set the default domain. Any context information given in a DECelms management command applies only to that command. For example, the following SHOW command displays the counters on the bridge BUILDINGD, but leaves the default domain, the bridge BUILDINGB, unchanged:

```
ELMS> SHOW BUILDINGD COUNTERS
```

Entering the following command displays the counters of the bridge BUILDINGB, because the default domain, the bridge BUILDINGB, remains unchanged.

```
ELMS> SHOW COUNTERS
```

1.10.3 Displaying the Default Domain

If you forget the default domain, enter the SHOW DOMAIN command. DECelms displays the default domain, as shown in the following example:

```
ELMS> SHOW DOMAIN

Current DOMAIN: Device BUILDINGB, 08-00-2B-0F-32-CD
```

1.11 The DECelms Registry

This section describes the DECelms registry, explains how to control the device listener function that automatically adds device entries, and gives procedures for manually adding, modifying, deleting, and displaying device entries.

1.11.1 DECelms Registry Operation

The DECelms registry is a database on the VAX or MicroVAX system running DECelms that contains **device entries** describing the bridges and wiring concentrators in the extended LAN. Each entry includes the device type, the device address (the addresses of both lines on the bridge for all bridge models except for the LAN Bridge 100), the ASCII name for the device, and a short description, as shown in the following example. Devices are listed in alphabetical order by name. Table 1–4 describes the device types shown in the DECelms registry entries.

```
Device Registry Status                          As of: 27-APR-1990 15:03:55

Device Type:                DEBET - LAN Bridge 100
Line 1 Address:             08-00-2B-3A-49-38
Line 2 Address:             08-00-2B-3A-49-38
Device Name:                LAN1TOLAN3
Description:                LAN Bridge 100 connecting floor 1 to 3

Device Type:                DEBAM - LAN Bridge 200
Line 1 Address:             08-00-2B-12-89-09
Line 2 Address:             08-00-2B-12-89-10
Device Name:                LAN5TOLAN4
Description:                LAN Bridge 200 connecting floor 4 to 5

Device Type:                DEFCN - DECconcentrator 500
Line 1 Address:             08-00-2B-12-BC-58
Device Name:                WC_SER1
Description:                Wiring Concentrator in SER 1
```

All other device, line, physical port, and forwarding database parameters are stored by the devices themselves in their volatile memory. The devices also store certain crucial parameter values in their nonvolatile memory (NVRAM) to allow for restarting with predictable values. This collection of data is referred to as the **device resident database**.

DECelms provides a **device listener function** that you can run in the background to add registry entries automatically for the bridges and wiring concentrators transmitting on the extended LAN. The device listener function listens to the MOP System ID messages on the extended LAN. When the device listener function hears a new device transmitting, it enters the device type and its address or addresses in the DECelms registry and assigns the device a name. See Section 1.11.2 for more information. Alternatively, you can fill the registry or modify the entries manually, as described in Section 1.11.5.

The DECelms registry allows you to use easy-to-remember names in DECelms commands rather than cumbersome hardware addresses. The registry allows you to use KNOWN BRIDGES, KNOWN CONCENTRATORS, and KNOWN DEVICES as the domain for DECelms commands. The registry also serves as a convenient repository for information about your devices. For example, you could include the physical location of each device or the name and phone number of the person responsible for hardware maintenance and repair.

After you fill your registry, you can use the LIST command to display a specific device entry or the LIST KNOWN DEVICES command to display the entire DECelms registry. (See Section 1.11.6.) You can maintain your registry by adding entries for new devices, modifying entries for existing devices, and deleting entries for devices that have been removed.

1.11.2 Automatic Registry Configuration

DECelms provides a device listener function to register automatically the bridges and wiring concentrators on the extended LAN in the DECelms registry. If enabled, as described in Section 1.11.3, the device listener function monitors the MOP System ID messages on the extended LAN. When it hears a new device, the device listener function:

- Queries the device for additional information and registers the device in the DECelms registry.
- Enters an event description in the event log
- Sends an event message to the message window of the DECelms screen display stating that a new device has been added to the DECelms registry

The device listener function enters the following information in the DECelms registry for each device.

Table 1–4: DECelms Registry Information Added by the Device Listener Function

Device Type	The type of device: DEBET (LAN Bridge 100); DEBET - LTM (LAN Bridge 100 serving as an LTM listener); DEBET 150 (LAN Bridge 150); DEBET 150 - LTM (LAN Bridge 150 serving as an LTM listener); DEBAM (LAN Bridge 200); DEFEB (DECbridge 500); or DEFCN (DECconcentrator 500).
Line 1 Address	The line 1 address for the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models. The device address for the LAN Bridge 100 and the DECconcentrator 500, because the LAN Bridge 100 does not have separate addresses for each line and the DECconcentrator 500 has only one line.
Line 2 Address	The line 2 address for the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models. The device address for the LAN Bridge 100 because the LAN Bridge 100 does not have separate addresses for each line. DECelms does not display this field for the DECconcentrator 500 because it has only one line.
Device Name	NM, an underscore, and the device address; for example: NM_08002B2A4276.

You can also add and modify device entries manually regardless of whether the listener function is running, as described in Section 1.11.5.

1.11.3 Controlling the Device Listener Function

You can start the device listener function during the DECelms installation procedure, as described in the *DECelms Installation* guide. After DECelms is installed, the START LISTENER and STOP LISTENER commands control the device listener function. START LISTENER and STOP LISTENER are valid in any command domain. The device listener function runs in the background and does not interfere with other DECelms commands.

NOTE

The device listener function conflicts with other applications, such as NMCC/VAX ETHERnim, that use the MOP remote console channel in shared default mode on the VMS system running DECelms. For more information see Section 1.11.4.

You can set the **duration**, the length of time that the device listener function listens for new devices on the MOP remote console channel. The default value for the duration is 12 minutes. You can also set the **idle time**, the pause between durations when the device listener function does not listen for new devices on the MOP remote console channel. When the device listener function resumes listening, it hears any new devices added during the idle time if they are still transmitting. The default value for the idle time is 18 minutes.

The following command starts the device listener function and instructs it to listen for new devices for 15 minutes, wait for 45 minutes, and then to repeat the cycle continuously:

```
ELMS> START LISTENER DURATION 15 MINUTES IDLE_TIME 45 MINUTES
```

The following command starts the device listener function with the default duration of 12 minutes and the default idle time of 18 minutes. The device listener function will listen twice an hour.

```
ELMS> START LISTENER
```

The following command stops the device listener function:

```
ELMS> STOP LISTENER
```

1.11.4 Use of the MOP Remote Console Channel

At the beginning of each duration, the device listener function checks to see if the MOP remote console channel is available for shared default use. If the channel is available, the device listener function uses it to listen to MOP system identification messages. If NMCC/VAX ETHERnim or some other application is using the MOP remote console channel, the device listener function fails and DECelms displays an error message.

1.11.5 Manual Registry Configuration

DECelms provides commands to add, modify, or delete the device entries in the DECelms registry manually, regardless of whether the device listener function is running.

If the device listener function is running, as described in Section 1.11.2, it will add entries for all the Digital bridges and wiring concentrators that are transmitting on the extended LAN. In that case, you need to modify the registry only if you want to:

- Change the device names from the default names assigned by the device listener function
- Add a textual description for each device
- Add an entry for a new device that is installed but not yet transmitting. You need to enter only the device address (or one of the line addresses for all bridge models except for the LAN Bridge 100). The device listener function will then complete the entry by querying the device for the additional information needed.

However, if you are not running the device listener function, you must add a registry entry manually for each device on your extended LAN. You should fill the registry shortly after installing DECelms so that you can use device names in commands. Registry entries for all of your devices also allow you to enter commands with the domains KNOWN BRIDGES, KNOWN CONCENTRATORS, and KNOWN DEVICES.

1.11.5.1 Preparing to Fill or Modify the DECelms Registry

This section explains how to gather the device addresses, names, and descriptions that you need to add or modify DECelms registry entries.

1. Collect the Device Addresses: Before filling the DECelms registry, collect and list the 48-bit hardware addresses of the devices in the extended LAN. Do not use the Station ID, the 64-bit address assigned to a DECbridge 500 or DECconcentrator 500. Each LAN Bridge 100 or DECconcentrator 500 has a single address for the device, because the LAN Bridge 100 does not have separate addresses for each line, and the DECconcentrator 500 has only one line.

For LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, you can use either of the line addresses for the registry entry. Once you add the entry, DECelms queries the bridge for the address of the other line and then adds the address to the registry entry.

For all of the devices managed by DECelms, the addresses are printed on labels attached to the backs of the devices. When adding a device entry to the DECelms registry, you must enter the device address the same way that it appears on the label (12 hexadecimal digits in the form *nn-nn-nn-nn-nn-nn*).

2. Assign the Device Names: Next, you can assign a name for each device to be used in DECelms commands. (When the device listener function is running, you can change the name from the default name assigned by DECelms—NM, an underscore, and the device address.) Assign names that are unique within the DECelms registry that will help you remember which device is which. For example, you might want to indicate the LANs that the bridge connects (LAN1TOLAN2) or describe the device's physical location (REVERE10C).

Device names can be up to 31 characters. The first character of the name must be a letter, but the others can be the letters A to Z, the digits 0 to 9, underscores (_), or dollar signs ($). You can enter letters in either uppercase or lowercase, but DECelms converts them to uppercase in the registry.

3. Collect Device Description Information: Finally, collect any information that you want to place in the optional 1- to 80-character description associated with each device entry in the DECelms registry. For example, you might want to include the physical location of the device or the name and phone number of the local maintenance contact. If you want a description, you must add one manually even if you are using automatic registry configuration, because the device listener function does not add descriptions.

1.11.5.2 Adding Device Entries to the Registry

The REGISTER command adds device entries to the DECelms registry. You must use this command to add device entries manually when the device listener function is not running. If the device listener function is running, you can use it to add an entry for a new device that is installed but not yet transmitting.

The command syntax includes NAME followed by the name you are assigning to the device, and ADDRESS followed by the device's address. For LAN Bridge 100 and DECbridge 500 models, use the device address. For LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, use one of the line addresses. The DESCRIPTION parameter is optional; if you use it, enclose your 1- to 80-character description in quotation marks.

DECelms displays an error message if you try to add an entry that already exists. The MODIFY command, described in Section 1.11.5.3, modifies existing entries.

Once you add the entry, DECelms will query the device for the address of the other line. In any case, DECelms will query the device to determine its device type. If DECelms cannot access the device, DECelms displays Unknown Type in the Device Type field of the registry entry and displays the address you supply in both the Line 1 Address field and the Line 2 Address field. DECelms will update this informatin when it can access the device.

The following command adds the bridge with the address 08-00-2B-0C-1A-A7 to the DECelms registry and assigns it the name BLDG2. The DESCRIPTION parameter gives the name and phone number of the maintenance contact.

```
ELMS> REGISTER NAME BLDG2 ADDRESS 08-00-2B-0C-1A-A7 DESCRIPTION "Paul Smith
      235-8937"
```

1.11.5.3 Modifying an Existing Registry Entry

The MODIFY command modifies an existing entry in the DECelms registry, regardless of whether it was added automatically by the device listener function or added manually with the REGISTER command. This command is especially useful for changing the name assigned by the device listener function and adding a device description. To modify a device entry, enter MODIFY followed by the existing name or address of the device. Also include NAME, ADDRESS, or DESCRIPTION, followed by the new information for the entry. Section 1.11.5.2 describes the requirements for each part of the entry. You need to supply only one of the addresses when changing the address of a bridge that has a separate address for each line. DECelms queries the bridge for the other address.

The following command modifies the description of an existing registry entry for the bridge BLDG5:

```
ELMS> MODIFY BLDG5 DESCRIPTION "Connects bldg 5 floors 1 and 2"
```

The following command renames the bridge that has the address 08-00-2B-0C-1A-A7:

```
ELMS> MODIFY 08-00-2B-0C-1A-A7 NAME LONGFELLOW
```

1.11.5.4 Deleting a Registry Entry

The DELETE command deletes entries from the DECelms registry. You can delete a specific bridge entry, all the bridge entries, all the wiring concentrator entries, or all the device entries in the registry. Note that if the device listener function is enabled it will automatically reenter the deleted entries. To remove entries permanently, you must disable the device listener function, as described in Section 1.11.3.

Deleting a Specific Registry Entry: To delete a specific device entry from the DECelms registry, enter DELETE and give the device's name or its address. DECelms displays an error message if the entry does not exist. The following command deletes the registry entry for the bridge BLDG5:

```
ELMS> DELETE BLDG5
```

The following command has the same effect, but it uses the bridge address rather than the bridge name:

```
ELMS> DELETE 08-00-2B-0C-1A-A7
```

Deleting All the Bridge or Wiring Concentrator Entries: To remove all the bridge or wiring concentrator entries from the DECelms registry, enter DELETE KNOWN BRIDGES or DELETE KNOWN CONCENTRATORS. You might want to use these commands when you rearrange the bridges or wiring concentrators in your network or implement a new naming scheme. The following command removes all the bridge entries from the DECelms registry:

```
ELMS> DELETE KNOWN BRIDGES
```

The following command removes all the wiring concentrator entries from the DECelms registry:

```
ELMS> DELETE KNOWN CONCENTRATORS
```

Cleaning Out the DECelms Registry: The DELETE KNOWN DEVICES command cleans out the entire DECelms directory. You might want to use this command when you rearrange your network or implement a new naming scheme. The following command removes all the entries from the DECelms registry:

```
ELMS> DELETE KNOWN DEVICES
```

1.11.6 Displaying the DECelms Registry

This section explains how use the LIST command to display the DECelms registry on your screen or send the registry contents to a file. You can display a specific entry, all the bridge entries, all the wiring concentrator entries, or the entire registry.

1.11.6.1 Displaying a Specific Entry

To display the registry entry for a specific device, enter LIST and the device's name or one of its addresses. The optional phrase TO *file-spec* sends the output to the specified file rather than to your screen. (You can specify the directory and file name, but not the node name or the device name.) The following command displays the registry entry for the bridge BLDG5:

```
ELMS> LIST BLDG5
```

The following command sends the registry entry for the wiring concentrator with the address 08-00-2B-21-A5-84 to the file GRANDCENTRAL.TXT:

```
ELMS> LIST 08-00-2B-21-A5-84 TO GRANDCENTRAL.TXT
```

1.11.6.2 Displaying All the Bridge or Wiring Concentrator Entries

To display all of the bridge or wiring concentrator entries in the DECelms registry, enter LIST KNOWN BRIDGES or LIST KNOWN CONCENTRATORS. The optional phrase TO *file-spec* sends the output to the specified file rather than to your screen. (You can specify the directory and file name, but not the node name or the device name.) The following command displays all the bridge entries in the DECelms registry:

```
ELMS> LIST KNOWN BRIDGES
```

The following command displays all the wiring concentrator entries in the DECelms registry:

```
ELMS> LIST KNOWN CONCENTRATORS
```

1.11.6.3 Displaying the Entire DECelms Registry

To display the entire DECelms registry, enter LIST KNOWN DEVICES. The optional phrase TO *file-spec* sends the output to the specified file rather than to your screen. (You can specify the directory and file name, but not the node name or the device name.) The following command displays the entire contents of the DECelms registry. In this example, there are only three entries.

```
ELMS> LIST KNOWN DEVICES

Device Registry Status                        As of: 27-APR-90 12:23:34

Device Type:                        DEBET - LAN Bridge 100
Line 1 Address:                     08-00-2B-3A-49-38
Line 2 Address:                     08-00-2B-3A-49-38
Device Name:                        LAN1TOLAN3
Description:                        LAN Bridge 100 connecting floor 1 to 3

Device Type:                        DEBAM - LAN Bridge 200
Line 1 Address:                     08-00-2B-12-89-09
Line 2 Address:                     08-00-2B-12-89-10
Device Name:                        LAN5TOLAN4
Description:                        LAN Bridge 200 connecting floor 4 to 5

Device Type:                        DEFCN - DECconcentrator 500
Line 1 Address:                     08-00-2B-12-BC-58
Device Name:                        WC_SER1
Description:                        Wiring Concentrator in SER 1
```

1.12 The DECelms Event Log

This section describes the DECelms event log, explains how DECelms enters events in the event log, and gives procedures for controlling the background poller function and generating reports from the event log.

1.12.1 Description of the DECelms Event Log

The DECelms event log is a collection of event descriptions generated by the device listener function and the background poller function. The paragraphs that follow explain how these functions generate event descriptions. Appendix A describes the content of the event descriptions.

Device Listener Function: If enabled, as described in Section 1.11.3, the device listener function monitors the MOP System ID messages on the extended LAN. When it hears a new device, the device listener function:

- Queries the device for additional information and registers the device in the DECelms registry, as described in Section 1.11.2
- Enters an event description in the event log
- Sends an event message to the message window of the DECelms screen display

Event descriptions generated by the device listener function begin with the numbers 1.5. The following example shows the event description generated by the device listener function when it hears a new LAN Bridge 200 on the extended LAN:

```
Event Logged Time: 27-APR-1990 14:05:28.63
Device Name      : NM_08002B0EDE7A
Device Type      : DEBAM - LAN Bridge 200
Line 1 Address   : 08-00-2B-0E-DE-7A
Line 2 Address   : 08-00-2B-0E-DE-79
Event Code       : 1.5.5
Event Description: New LAN Bridge 200 on network
```

Background Poller Function: If enabled, the background poller function polls the devices listed in the DECelms registry. See Section 1.12.2 for information about starting and stopping the background poller function and controlling the timing of the polls. The background poller function maintains a database of device states and recognizes events if the state information returned by the polled device is different. When it detects a change in device state, the background poller function:

- Enters an event description in the event log
- Sends an event message to the message window of the DECelms screen display
- Updates its device state database

The background poller function polls the devices in the order that they are listed in the DECelms registry. DECelms polls the entities of each device in the order shown below. The background poller function also polls the attributes of each entity in a set order.

1. Device itself
2. Line 1
3. Line 2 (if present)
4. Physical ports in numerical order (if present)

The timestamp on an event message or event description reflects the polling order described above, not the actual time when the state change occurred. The duration and idle time set for the background poller (see Section 1.12.2) also affect the timing of event messages.

The following example shows the event description generated by the background poller function when the line to the root (Inlink) on a LAN Bridge 200 changes from line 1 to line 2.

```
Event Logged Time: 27-APR-1990 14:05:28.71
Device Name      : NM_08002B0EDE7A
Device Type      : DEBAM - LAN Bridge 200
Line 1 Address   : 08-00-2B-0E-DE-7A
Line 2 Address   : 08-00-2B-0E-DE-79
Event Code       : 3.1.10
Event Description: Inlink
Previous Value   : 1
Current Value    : 2
```

1.12.2 Controlling the Background Poller Function

You can start the background poller function during the DECelms installation procedure, as described in the *DECelms Installation* guide. After DECelms is installed, the START POLLER and STOP POLLER commands control the background poller function. START POLLER and STOP POLLER are valid in any command domain.

The PAUSE parameter sets the pause between polling each device listed in the DECelms registry, preventing the burst of messages that might result if the devices were polled (or responded) at once. The default pause is 0 seconds, meaning that the background poller function polls the devices as rapidly as possible.

The IDLE_TIME parameter sets the idle time, the pause between each complete poll of the devices listed in the DECelms registry. When the background poller function has completed a poll of the devices in the DECelms registry, it waits for the idle time and then polls the list again. The default idle time is 0 seconds, meaning that the background poller function continuously polls the devices listed in the DECelms registry.

The following command starts the background poller function and instructs it to pause 10 seconds between polling each device and 15 minutes between each complete poll of the DECelms registry:

```
ELMS> START POLLER PAUSE 10 SECONDS IDLE_TIME 15 MINUTES
```

The following command starts the background poller function with the default pause time of 0 seconds and the default idle time of 0 seconds. The background poller function continuously polls the devices listed in the DECelms registry as rapidly as possible.

```
ELMS> START POLLER
```

The following command stops the background poller function:

```
ELMS> STOP POLLER
```

1.12.3 Archiving a Log File

To archive the current event log and start a new one, follow this procedure:

1. Use the SET DEFAULT command to move to SYS$COMMON:[ELMS$DIRECTORY].
2. Enter @SYS$COMMON:[SYSMGR]ELMS$SHUTDOWN.COM at the DCL prompt ($) to stop DECelms.
3. Use the DCL command RENAME to rename the current event log file, ELMS$STATE_CHANGE.LOG.
4. Enter @SYS$STARTUP:ELMS$STARTUP.COM to restart DECelms. DECelms automatically creates a new event log file with the same name, ELMS$STATE_CHANGE.LOG.

The following commands archive the current event log and give it the name OLDEVENTLOG.TXT:

```
$ SET DEFAULT SYS$COMMON:[ELMS$DIRECTORY]
$ @SYS$COMMON:[SYSMGR]ELMS$SHUTDOWN.COM
$ RENAME ELMS$STATE_CHANGE.LOG OLDEVENTLOG.TXT
$ @SYS$STARTUP:ELMS$STARTUP.COM
```

1.12.4 Generating Reports from the Event Log

The FORMAT command generates reports from the DECelms event log, a binary file. FORMAT displays the event descriptions from the event log in a readable format or sends them to a readable file. By default, FORMAT reads the current log file, ELMS$HOME:ELMS$STATE_CHANGE.LOG. To generate a report from an old log file, include FROM and the file name of the old log file.

To limit the report to the events generated after a certain time, include the optional phrase SINCE *hh:mm dd-mmm-yy*.

By default, FORMAT displays the event log in the display window of the DECelms screen. The optional phrase TO *file-spec* sends the output to the file you specify. You can specify the file name but not the node name, device name, or directory. DECelms places the file in the current default directory.

You can use the optional phrases independently or in any combination, but you must enter them in the order FROM, SINCE, and then TO.

Section 1.12.1 shows the format of the event descriptions in the log; Appendix A describes their contents. The following command displays the current event log in the display window of the DECelms screen:

```
ELMS> FORMAT
```

The following command sends all the events generated after 11:00 AM on April 23, 1990 to the file EVENTLOG.REPORT:

```
ELMS> FORMAT SINCE 11:00 23-APR-90 TO EVENTLOG.REPORT
```

The following command displays the events in an archived event log file named OLDEVENT.LOG:

```
ELMS> FORMAT FROM OLDEVENT.LOG
```

1.13 Controlling the Display of Event Messages

The START ALARM and STOP ALARM commands enable and disable the display of event messages on your terminal. Both commands are valid in all command domains. Alarm messages are generated by the device listener function when a new device transmits on the network or by the background poller function when a device's state changes. The following command enables the display of event messages on your terminal. You would use this command if a previous STOP ALARM command stopped the display of event messages on your terminal.

```
ELMS> START ALARM
```

The following command instructs DECelms to stop displaying event messages on your terminal.

```
ELMS> STOP ALARM
```

Chapter 2 explains how to use DECelms to configure and manage the bridges and wiring concentrators in your extended LAN.

2 Managing and Configuring Devices

This chapter describes how to use DECelms (DEC Extended LAN Management Software) to perform the following device configuration and management tasks:

- Setting the Device Password
- Initializing Devices
- Configuring Bridge Spanning Tree Parameters
- Configuring a Device for Up-Line Dumping
- Configuring a Bridge for Software Down-Line Loading
- Configuring a Bridge to Be an LTM Listener
- Controlling Down-Line Loading of Firmware Upgrades
- Controlling IP Fragmentation on a DECbridge 500

2.1 Setting the Device Password

You can set a password for each LAN Bridge 150, LAN Bridge 200, DECbridge 500, and DECconcentrator 500 in your extended LAN. (The LAN Bridge 100 model does not support passwords.) The password is stored in the device's nonvolatile memory (NVRAM). A device that has a password set checks that the correct password is supplied with any DECelms configuration or control command and rejects any command with an incorrect or absent password. The following commands require a password. (You must also be using the privileged mode of DECelms to use these commands, as described in Section 1.2.)

ADD
DISABLE
ENABLE
INITIALIZE
REMOVE
SET

This section explains how to set a new password, change an existing password, and recover from a forgotten password.

2.1.1 Setting a Password for the First Time

The LAN Bridge 150, LAN Bridge 200, DECbridge 500, and DECconcentrator 500 come from the factory without a password stored in their NVRAM. You should set a password before using the device, because a device without a password set accepts DECelms commands that have incorrect or omitted passwords. Thus, a device without a password is vulnerable to unauthorized configuration and control. To give a new device a password for the first time, enter:

```
ELMS> SET NEW PASSWORD new-password PASSWORD ""
```

where *new-password* is the password you are assigning and "" indicates that the device currently has no password set. You must include the quotation marks. The password must be 6 to 12 characters long. It can contain any letters or digits from the ISO Latin-1 character set, underscores (_), or hyphens (-). Passwords are not case sensitive: dull_boy and DULL_BOY represent the same password. The following example sets the password for a new bridge named SUNSHINESKYWAY:

```
ELMS> USE SUNSHINESKYWAY
ELMS> SET NEW PASSWORD NEWBOY PASSWORD ""
```

2.1.2 Changing an Existing Password

Changing an existing password is the same as setting a new one, except that you must also supply the old password. The same length and character restrictions apply. The following example changes the password for a bridge named WALTWHITMAN:

```
ELMS> USE WALTWHITMAN
ELMS> SET NEW PASSWORD NEWBOY PASSWORD OLDBOY
```

2.1.3 Recovering from a Forgotten Password

If you forget a device's password, you must reset the device's NVRAM. Resetting NVRAM deletes the password. For bridges, resetting NVRAM also clears any forwarding or protocol entries added with DECelms, and resets all the spanning tree parameters to the factory default values. For all devices, resetting NVRAM erases any information that was entered with DECelms commands. Before resetting NVRAM on a bridge, it is wise to record the spanning tree parameter values, forwarding entries, and protocol entries that were entered with DECelms. The following commands save all the management information stored in the bridge named GOLDENGATE:

```
ELMS> USE GOLDENGATE
ELMS> SHOW SPANNING CHARACTERISTICS TO GOLDENGATE.SPAN
ELMS> SHOW MANAGEMENT PHYSICAL ADDRESSES TO GOLDENGATE.PHYSADDRESS
ELMS> SHOW MANAGEMENT MULTICAST ADDRESSES TO GOLDENGATE.MULTIADDRESS
ELMS> SHOW MANAGEMENT PROTOCOLS ETHERNET TYPES TO GOLDENGATE.PROTOCOL
ELMS> SHOW MANAGEMENT PROTOCOLS 802 SAPS TO GOLDENGATE.PROTOCOL
ELMS> SHOW MANAGEMENT PROTOCOLS 802 SNAPS TO GOLDENGATE.PROTOCOL
```

To reset NVRAM, unplug the device from its power source, push down (to ON) the NVRAM Reset switch on the device, reconnect the power, and then push up (to OFF) the NVRAM Reset switch. (See the device hardware documentation for more information on the NVRAM Reset switch.) After resetting NVRAM, set a new password, as described in Section 2.1.1.

2.2 Initializing Devices

Initializing a device forces it to run its self-test sequence and resets it to a known state, just as if it had been physically turned off and then on again. Initializing a device also sets its counters back to zero. You can simply initialize the device or initialize it and clean out its NVRAM. Cleaning out the NVRAM of a device removes any spanning tree parameters, forwarding entries, protocol entries, and other information that was entered with DECelms commands.

Upon initialization, a device performs the following steps:

- Conducts a series of hardware self-tests
- Resets its counters to zero
- Requests a down-line load of software if so configured

A bridge also performs the following additional steps:

- Participates in the spanning tree computation process to see if it is the root bridge or a designated bridge
- Enters the PREFORWARDING state, where the bridge's learning process enters address information in the forwarding database
- Automatically enters the FORWARDING state (normal operation) if the self-tests are successful and the bridge is not a backup bridge

Refer to the *Bridge and Extended LAN Reference* for a complete description of bridge self-tests and operational states and the spanning tree computation process. Refer to the *DECbridge 500 Problem Solving* guide and the *DECconcentrator 500 Problem Solving* guide for more information on the operational states and self-tests of those devices.

2.2.1 Initializing a Device with the INITIALIZE Command

The INITIALIZE command initializes a device and forces it to run its self-tests. Use this command when you suspect a hardware problem, when you want to reset the device to a known state, or when you want to set the counters back to zero. This form of the INITIALIZE command retains any spanning tree parameters, forwarding entries, protocol entries, or other management information stored in the device's NVRAM. If the target device is a LAN Bridge 150, LAN Bridge 200, DECbridge 500, or DECconcentrator 500 that has a password set, you must include PASSWORD and the device's password. The following commands initialize the LAN Bridge 150 named TUNKHANNOCK, which has the password LAZYRIVER:

```
ELMS> USE TUNKHANNOCK
ELMS> INITIALIZE PASSWORD LAZYRIVER

Command will initialize device TUNKHANNOCK
Do you really want to initialize Device 08-00-2B-0E-23-9C ? YES
```

When the device self-tests are complete, you can enter a SHOW STATUS command to check the operational state of the device, as described in Section 5.1.1.1.

2.2.2 Initializing a Device with Default Parameter Values

The INITALIZE WITH DEFAULTS command has the same effect as INITIALIZE, except that it also erases any information that was added to the device's NVRAM with DECelms commands. For bridges, it sets all of the bridge's spanning tree parameters to the factory default values and removes any forwarding entries or protocol entries stored in the bridge's NVRAM. (Entries stored in NVRAM were entered with DECelms.) Use this command when you suspect that a device is improperly configured.

Before using this command for a bridge, you should record the spanning tree parameter values, address entries, and protocol entries that were entered with DECelms. The following commands save all the management information stored in the bridge named GOLDENGATE:

```
ELMS> USE GOLDENGATE
ELMS> SHOW SPANNING CHARACTERISTICS TO GOLDENGATE.SPAN
ELMS> SHOW MANAGEMENT PHYSICAL ADDRESSES TO GOLDENGATE.PHYSADDRESS
ELMS> SHOW MANAGEMENT MULTICAST ADDRESSES TO GOLDENGATE.MULTIADDRESS
ELMS> SHOW MANAGEMENT PROTOCOLS ETHERNET TYPES TO GOLDENGATE.PROTOCOL
ELMS> SHOW MANAGEMENT PROTOCOLS 802 SAPS TO GOLDENGATE.PROTOCOL
ELMS> SHOW MANAGEMENT PROTOCOLS 802 SNAPS TO GOLDENGATE.PROTOCOL
```

The following commands initialize the wiring concentrator GRANDCENTRAL with the factory default parameter settings. Again, the password is mandatory if the target device is a LAN Bridge 150, LAN Bridge 200, DECbridge 500, or DECconcentrator 500 that has a password set. The target device verifies the password and rejects the command if it does not match.

```
ELMS> USE GRANDCENTRAL
ELMS> INITIALIZE WITH DEFAULTS PASSWORD CELESTIAL

Command will initialize device GRANDCENTRAL with defaults
Do you really want to initialize device 08-00-2B-0E-41-8C ? YES
```

2.3 Configuring Bridge Spanning Tree Parameters

Using DECelms, you can display the settings of a bridge's spanning tree parameters and view the outcome of the spanning tree computation process. DECelms also allows you to set 12 of these parameters for each bridge. (You can also set the Line Cost spanning tree parameter for each line on the bridge, as described in Section 3.1.) The *Bridge and Extended LAN Reference* contains a complete description of the spanning tree computation process and the spanning tree parameters.

This section explains how to display parameter values with the SHOW SPANNING CHARACTERISTICS command, describes how to set parameters with the SET SPANNING CHARACTERISTICS command, and provides guidance on choosing the value for each parameter. It also describes how to reset a bridge to the factory default parameter values.

2.3.1 Displaying the Current Spanning Tree Parameter Settings

To display the current parameter settings for a bridge, enter the SHOW SPANNING CHARACTERISTICS command:

```
ELMS> USE HENRYHUDSON
ELMS> SHOW SPANNING CHARACTERISTICS

Show Device Spanning Characteristics      As of: 27-APR-1990 11:20:00
Name: HENRYHUDSON                          Address: 08-00-2B-0C-1A-A7

Best Root:                                      10 / 08-00-2B-06-25-C7
Best Root Age:                                  1
My Cost:                                        40
Inlink:                                         2
Topology Change Flag:                           False
Tell Parent Flag:                               False
Actual Hello Interval:                          1
Actual Listen Time:                             15
Actual Forwarding Delay:                        30
Root Priority:                                  128
Forwarding Database Normal Aging Time:          120
Forwarding Database Short Aging Time:           30
Bad Hello Limit:                                15
Bad Hello Reset Interval:                       5
No Frame Interval:                              300
LAN Bridge 100 Poll Time:                       300
LAN Bridge 100 Response Timeout:                15
Hello Interval:                                 1
Listen Time:                                    15
Forwarding Delay:                               30
LAN Bridge 100 Spanning Tree Compatibility:     Auto-Select
```

The first 9 parameters in the display are nonsettable: they show the outcome of the spanning tree computation process. (Refer to Section 5.3.1 for a description of these nonsettable parameters). Section 2.3.4 describes the last 12 parameters, which you can set with DECelms.

Include the TO *file-spec* phrase to send the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.) For example:

```
ELMS> SHOW VERRAZANO SPANNING CHARACTERISTICS TO VERRAZANO.PAR
```

2.3.2 Setting Bridge Spanning Tree Parameters

The SET SPANNING CHARACTERISTICS comand sets the spanning tree parameters for a bridge. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password. DECelms prompts you for the parameters one at a time, with the parameter name followed by the current setting. To accept the current setting, press [Return]. To change the setting, type the new setting and press [Return]. An example of the DECelms prompts for this command follows. Table 2–1 summarizes the valid settings for the bridge spanning tree parameters.

```
ELMS> USE MACKINAC
ELMS> SET SPANNING CHARACTERISTICS PASSWORD MIDAMERICA

Root Priority (128) ?

Forwarding Database Normal Aging Time (120) ?

Forwarding Database Short Aging Time (30) ?

Bad Hello Limit (15) ?

Bad Hello Reset Interval (5) ?

No Frame Interval (300) ?

Hello Interval (1) ?

Listen Time (15) ?

Forwarding Delay (30) ?

Lan Bridge 100 Poll Time (300) ?

Lan Bridge 100 Response Timeout (15) ?

Lan Bridge 100 Spanning Tree Compatibility (Auto-Select) ?
```

Table 2–1: Settable Spanning Tree Parameters

Parameter	Range	Default	Restrictions
Root Priority	1-255	128	None.
Forwarding Database Normal Aging Time	15-945 seconds	120 seconds	See Short Aging Time.

Table 2–1 (Cont.): Settable Spanning Tree Parameters

Parameter	Range	Default	Restrictions
Forwarding Database Short Aging Time	15-255 seconds	30 seconds	Must be less than or equal to Normal Aging Time. Value must be a multiple of 15.
Bad Hello Limit	10-255 Hello Intervals	15 Hello Intervals	None.
Bad Hello Reset Interval	1-255 Hello Intervals	5 Hello Intervals	None.
No Frame Interval	60-900 seconds	300 seconds	Applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models. Digital recommends that you leave this parameter at its default value.
Hello Interval	1-64 seconds	1 second	Must not be set higher than 1/4 the value of Listen Time.
Listen Time	1-255 seconds	15 seconds	Must be greater than (4 * Hello Interval) + maximum delay in network.
Forwarding Delay	1-255 seconds	30 seconds	Must be greater than or equal to Listen Time + maximum delay in network
LAN Bridge 100 Poll Time	30-3600 seconds	300 seconds	Applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models. Digital recommends that you leave this parameter at its default value.

Table 2–1 (Cont.): Settable Spanning Tree Parameters

Parameter	Range	Default	Restrictions
LAN Bridge 100 Response Timeout	2-15 seconds	15 seconds	Applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models. Digital recommends that you leave this parameter at its default value.
LAN Bridge 100 Spanning Tree Compatibility	Auto-Select, IEEE	Auto-Select	Applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

2.3.3 Configuring a Bridge with Default Parameter Settings

To configure a bridge with factory default parameter settings, enter the SET SPANNING CHARACTERISTICS TO DEFAULTS command. If the target bridge is a LAN Bridge 150, a LAN Bridge 200, or a DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password. For example:

```
ELMS> USE WALTWHITMAN
ELMS> SET SPANNING CHARACTERISTICS TO DEFAULTS PASSWORD BROTHERLY
```

DECelms resets the spanning tree parameters to the factory default settings and initializes the bridge, making the new settings take effect immediately. You might want to use this command when you suspect that a bridge is having problems because of misconfiguration, but be sure to record its existing parameter settings first, as described in Section 2.3.1.

2.3.4 Choosing Spanning Tree Parameter Values

By setting the spanning tree parameters, you can influence the outcome of the spanning tree computation process, which is fully described in the *Bridge and Extended LAN Reference*. The Root Priority and Line Cost parameters, together with the physical placement of bridges, determine the logical layout of the extended LAN. (Line Cost is set for each line on the bridge, as described in Section 3.1.) The values for the Hello Interval, Listen Time, and Forwarding Delay parameters do not need to be changed

as frequently as the Root Priority and Line Cost parameters. The remaining settable parameters are the least likely to be changed. They are provided for fine-tuning the network and should be altered only by experienced network management professionals. This section describes each of the settable bridge spanning tree parameters and provides guidance on choosing the right value.

2.3.4.1 Root Priority

The Root Priority parameter establishes a bridge's priority for becoming the root bridge of the extended network spanning tree. The Root Priority parameter value is used as a prefix to the bridge's address to form the bridge's identification; for example, 128/08-00-2B-2C-08-21. On LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, the line address with the lower hexadecimal value is used for the bridge identification.

This bridge identification is used in comparisons whenever the bridge receives a new Hello message. The bridge compares the root bridge identification and the designated bridge identification in the Hello message to the bridge's current root bridge and the line's current designated bridge. If the new values for the root bridge and designated bridge are lower than the current values, the bridge uses the new values.

Because the Root Priority parameter value is the most significant byte of the bridge identification, its value is the most important in the comparison. Root Priority must be in the range of 1 to 255. A high value makes the bridge **less** likely to become the root bridge. A low value makes the bridge **more** likely to become the root bridge. If all bridges have the default value of 128, root bridge selection depends entirely on the bridge address. (The bridge with the lowest address becomes the root bridge.)

NOTE

> Changing the Root Priority parameter value of a bridge after the spanning tree algorithm determines the root may result in network reconfiguration.

If the major part of the topology consists of a set of treelike structures extending from a backbone segment or ring, set the Root Priority parameter to be the number of levels that the bridge is away from the backbone. In this way, the bridge that is closest to the backbone will become the root bridge.

This is desirable because it minimizes the average number of hops that traffic must take between stations in the extended network. This choice also minimizes the topology changes that would occur if the root bridge changed.

2.3.4.2 Forwarding Database Normal Aging Time

The Forwarding Database Normal Aging Time parameter controls how long a bridge retains learned entries in its forwarding database. If the bridge does not see the address of a learned entry in the source address of a frame during the time set for this parameter, the bridge marks the entry inactive. The bridge then removes the inactive entries the next time it purges its forwarding database. Each time the bridge sees the address of an entry in the source address of a frame, the bridge resets the entry's age to zero.

Management entries (added with DECelms) are not affected by this parameter; they are retained until they are removed with DECelms (or until the next bridge restart or power-down if they were entered only in volatile memory).

This parameter must be in the range of 15 to 945 seconds and must be specified as a multiple of 15. A high value for this parameter causes the bridge to maintain database entries for a longer period of time. If the bridge has limited memory available for the forwarding database, this may present a problem. A low value for this parameter allows the bridge to remove database entries quickly. This frees database memory but may lead to a high degree of frame forwarding due to missing database entries. The default value of 120 seconds represents a compromise between premature loss of database entries and unnecessary storage of unused entries.

2.3.4.3 Forwarding Database Short Aging Time

The Forwarding Database Short Aging Time parameter works in the same way as the Forwarding Database Normal Aging Time parameter, except that it applies only immediately after a topology change. For bridges in the LAN Bridge 100 Spanning Tree Mode, the Forwarding Database Short Aging Time value is in effect for the period of time that is the sum of the root bridge's Forwarding Delay value plus the root bridge's Forwarding Database Short Aging Time value. For bridges in the 802 Spanning Tree Mode, the duration is half of the root bridge's Forwarding Delay value plus the root bridge's Listen Time value.

The Forwarding Database Short Aging Time parameter must be in the range of 15 to 255 seconds and must be specified as a multiple of 15. This parameter must always be less than or equal to the Forwarding Database Normal Aging Time parameter. The default value of 30 seconds causes a fairly rapid aging of entries, which is desirable after a topology change.

2.3.4.4 Bad Hello Limit

The Bad Hello Limit parameter specifies the number of Hello Intervals during which one or more bad Hello messages are received on a line, before the bridge performs a hardware reset and self-test on the line. A bad Hello message is a Hello message containing inferior root information received from another bridge on the line for which the receiving bridge is the designated bridge. In a stable configuration, only the designated bridge should be sending Hello messages. Therefore, if a designated bridge repeatedly receives a number of bad Hello messages, it detects that something is wrong (for instance, the transmitting bridge did not receive its Hello message).

The Bad Hello Limit parameter must be in the range of 10 to 255 Hello Intervals. A low value for this limit results in faster detection of problem lines but may cause false alarms (and, thus, unnecessary recycling of lines) in an unstable environment. Some bad Hello messages are expected whenever a bridge initializes or whenever the network is reconfiguring; therefore, the minimum number of Hello Intervals is 10. A high value for this limit decreases unnecessary line recycling but slows detection of problem lines. The default value of 15 bad Hello Intervals represents a compromise between unnecessary line recycling and fast problem detection.

2.3.4.5 Bad Hello Reset Interval

The Bad Hello Reset Interval parameter specifies how many consecutive Hello Intervals without bad Hello messages a bridge will wait before it resets the Bad Hello Count to zero. In other words, the Bad Hello Reset Interval is the length of time that a bridge holds its Bad Hello Count value even though the bridge is currently not receiving any bad Hello messages. The bridge automatically restarts this timer whenever it receives another bad Hello message. The timer is expressed in Hello Intervals (see Section 2.3.4.7).

The Bad Hello Reset Interval parameter must be in the range of 1 to 255 Hello Intervals. A low value for this parameter can cause the Bad Hello Count to be reset to zero too soon, preventing the bridge from detecting a problem line. If this value is too high, the Bad Hello Count may not be reset. Because some bad Hello messages will always occur, the Bad Hello

Count will ultimately reach the Bad Hello Limit. This can cause a false alarm even if the bridge's line is **not** faulty. The default value of 5 Hello Intervals causes the bridge to wait 5 Hello Intervals after a bad Hello message is received before resetting the Bad Hello Count to zero. This represents a suitable compromise.

2.3.4.6 No Frame Interval

The No Frame Interval parameter sets the maximum number of seconds that can elapse without the bridge receiving a frame on a line. If a line is idle for longer than the No Frame Interval, the bridge runs its self-test and initiates the spanning tree computation process. This parameter applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

The No Frame Interval parameter must be in the range of 60 to 900 seconds (15 minutes); the default value is 300 seconds (5 minutes). Digital recommends that you leave this parameter at its default value.

2.3.4.7 Hello Interval

The Hello Interval parameter specifies the value of an interval timer that controls how often a bridge sends a Hello message on each of its lines when it is serving as the root bridge. There is one Hello timer per bridge; the bridge sends Hello messages on all its lines when the timer expires.

The Hello Interval parameter must be in the range of 1 to 64 seconds. Do not set this parameter higher than one-fourth of the value of the Listen Time parameter. A low value for this timer results in increased traffic flow but a faster reconfiguration in the event of a topology change. A high value for this timer results in decreased traffic but a slower response to topology changes. The default value of 1 second provides for a fast reconfiguration in the event of a network topology change.

NOTE

Although this parameter can be set in all bridges, it has an immediate effect only if the bridge is the root bridge or if the network is reconfiguring. After the spanning tree computation process is completed, all bridges send Hello messages only after receiving one.

2.3.4.8 Listen Time

The Listen Time parameter specifies the time, in seconds, after which the bridge considers a Hello message to be stale. When the bridge receives a Hello message from the designated bridge on one of its lines, the bridge keeps track of the age of the Hello message and increments the age every second. When the age of the last Hello message received exceeds the Listen Time value, the bridge concludes that a topology change occurred and initializes the line. The bridge then sends out Hello messages on both of its lines, declaring itself to be the root bridge.

The Listen Time parameter must be in the range of 1 to 255 seconds. It must always be greater than the time it takes a Hello message (with three lost messages) to travel between any two bridges in the extended network. This time is calculated by the formula: (4 * Hello Interval) + maximum delay in network. (Maximum delay in network is the worst-case time for a Hello message to travel between any two bridges.)

A low value for this parameter results in faster detection of failed lines but may lead to excessive line recycling if too many Hello messages are lost. A high value results in slower detection of problem lines but a more accurate detection of true problem lines. The default value of 15 seconds allows for several lost Hello messages before the line is reinitialized.

NOTE

> The Listen Time parameter has an immediate effect only if the bridge is the root bridge. After the spanning tree computation process is completed, all bridges use the value set in the root bridge (and propagated by Hello messages).

2.3.4.9 Forwarding Delay

The Forwarding Delay parameter specifies the amount of time that a bridge's lines stay in the PREFORWARDING state before entering the FORWARDING state. During the first half of the forwarding delay, the bridge participates in the spanning tree computation process. During the second half, the bridge learns addresses by listening to frames on both of its lines. (The bridge adds the source address and incoming line number of each frame to its forwarding database.)

The Forwarding Delay parameter must be in the range of 1 to 255 seconds. This parameter must be set to a value greater than or equal to the Listen Time parameter value plus the maximum delay in the network.

A low value allows the lines to perform forwarding sooner. However, it also results in a greater possibility of temporary loops being formed and an increase in the amount of forwarding of frames for the first several minutes of operation (because of inadequate information in the forwarding database).

A high value results in forwarding being delayed longer but decreases the amount of forwarding that a bridge does when it first starts frame forwarding. The default value of 30 seconds allows the bridge to build up a reasonable forwarding database before it starts forwarding and thus limits the amount of forwarding that occurs in the first several minutes of operation.

NOTE

Although you can set this parameter in all bridges, it has an immediate effect only if the bridge is the root bridge. After the spanning tree computation process completes, all bridges use the value set in the root bridge (and propagated by Hello messages).

2.3.4.10 LAN Bridge 100 Poll Time

The LAN Bridge 100 Poll Time parameter specifies the number of seconds that the root bridge waits between polling to see if there are any bridges on the extended LAN that can run only in the LAN Bridge 100 Spanning Tree Mode. If no bridges respond within the LAN Bridge 100 Response Timeout, described in the next section, the root bridge and all the other bridges switch to the 802 Spanning Tree Mode.

Although you can set this parameter for all bridges, it applies only when the bridge is the root bridge and only if the LAN Bridge 100 Spanning Tree Compatibility parameter is set to Auto-Select. This parameter applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

The LAN Bridge 100 Poll Time parameter must be in the range of 30 to 3600 seconds (1 hour); the default value is 300 seconds (5 minutes). Digital recommends that you leave this parameter at its default value.

2.3.4.11 LAN Bridge 100 Response Timeout

The LAN Bridge 100 Response Timeout parameter specifies the number of seconds that the root bridge will wait for a response to a poll before switching to the 802 Spanning Tree Mode. (See Section 2.3.4.10.) This parameter applies only when the bridge is the root bridge and only if the LAN Bridge 100 Spanning Tree Compatibility parameter is set to Auto-Select. This parameter applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

The LAN Bridge 100 Response Timeout parameter must be in the range of 2 to 15 seconds; the default value is 15 seconds. Digital recommends that you leave this parameter at its default value.

2.3.4.12 LAN Bridge 100 Spanning Tree Compatibility

The LAN Bridge 100 Spanning Tree Compatibility parameter controls the spanning tree mode used by a LAN Bridge 150, LAN Bridge 200, or DECbridge 500. When set to Auto-Select, the bridge uses the 802 Spanning Tree Mode unless the root bridge detects a bridge that can run only in the LAN Bridge 100 Spanning Tree Mode, in which case the bridge reverts to the LAN Bridge 100 Spanning Tree Mode. Thus, the bridge is compatible with the LAN Bridge 100 Spanning Tree Mode.

When this parameter is set to IEEE, the bridge stays in the 802 Spanning Tree Mode (IEEE 802.1) and is thus incompatible with the LAN Bridge 100 Spanning Tree Mode. The default value for this parameter is Auto-Select.

2.4 Configuring a Device for Up-Line Dumping

Your Digital Customer Service representative may want you to configure your LAN Bridge 200, DECbridge 500, and DECconcentrator 500 devices for up-line dumping, so that a memory image is sent to a DECnet-VAX host if a fatal error causes the device to crash. Digital Customer Service can then analyze this dump file to determine the cause of failure. This section explains how to set up a DECnet-VAX host to receive up-line dumps. It also describes how to enable or disable up-line dumping on the device and how to indicate the host to which the device will send its up-line dumps.

2.4.1 Setting Up a DECnet-VAX Host to Receive Up-Line Dumps

A device cannot make an up-line dump unless there is an active DECnet-VAX host set up to receive it. You should set up a primary host and configure the devices to send their up-line dump requests to that host, as described in Section 2.4.3. It is also wise to have one or more backup hosts set up to receive the up-line dumps if the primary host is down. This will happen automatically, because the device will send out a multicast up-line dump request if the primary host does not respond within a timeout period.

There are two steps to set up a DECnet-VAX host to receive device up-line dumps. The procedure is the same for primary and backup up-line dump hosts. First, use NCP to make an entry in the DECnet node database for each device that will be sending up-line dumps. Enter the following information for the entry:

- The line address that has the lower hexadecimal value for a LAN Bridge 200 or a DECbridge 500, or the device address for a DECconcentrator 500
- Service circuit for the device
- File name, directory, and disk where the dump file is to be placed on the host. (If you do not enter this information, the dump file will be placed in the default directory for up-line dumps on the host.)

After making the node database entry, you must enable the service circuit. The following example shows the commands to add entries for a LAN Bridge 200 named DEBAM with the address 08-00-2B-02-34-56 and the service circuit BNA-0. The host will place up-line dump files received from DEBAM in the file SYS$COMMON:[DECSERVER]DEBAMDUMP.DMP. The last command enables the service circuit BNA-0.

```
NCP> DEFINE 13.999 NAME DEBAM
NCP> DEFINE NODE DEBAM HARDWARE ADDRESS 08-00-2B-02-34-56
NCP> DEFINE NODE DEBAM SERVICE CIRCUIT BNA-0
NCP> DEFINE NODE DEBAM DUMP FILE SYS$COMMON:[DECSERVER]DEBAMDUMP.DMP
NCP> SET NODE DEBAM ALL
NCP> DEFINE CIRCUIT BNA-0 SERVICE ENABLED
```

2.4.2 Enabling and Disabling Up-Line Dumping

The SET DUMP SWITCH TRUE command enables up-line dumping on a LAN Bridge 200, DECbridge 500, or DECconcentrator 500. If a fatal error causes the device to crash, the device sends an up-line dump request to the DECnet-VAX host that you specified with the SET DUMP HOST command, as described in Section 2.4.3. If the target host does not respond within a timeout period, the device sends a multicast up-line dump request. When an appropriately configured DECnet-VAX host responds, the device sends all or part of its memory and CPU registers. The SET DUMP SWITCH FALSE command disables the up-line dumping functions. Both commands require the target device's password if it has a password set, as shown in the following example:

```
ELMS> USE SUNSHINESKYWAY
ELMS> SET DUMP SWITCH TRUE PASSWORD ONTHEWATER
```

2.4.3 Specifying the Up-Line Dump Host

The SET DUMP HOST command specifies the physical address of the host to which the device will send its initial up-line dump request. The target host must be configured to receive up-line dumps, as described in Section 2.4.1. If the target host does not respond within a timeout period, the device sends a multicast up-line dump request to which any appropriately configured DECnet-VAX host may respond. The SET DUMP HOST NONE command clears a previously entered address. Use this command when you are disabling up-line dumping and want to clear out the up-line dump information. If the target device has a password set, you must include PASSWORD and the target device's password. You must enclose the physical address of the target host in quotation marks. The following example specifies the up-line dump host for the bridge SUNSHINESKYWAY:

```
ELMS> USE SUNSHINESKYWAY
ELMS> SET DUMP HOST AA-00-04-00-32-A3 PASSWORD ONTHEWATER
```

2.4.4 Displaying Up-Line Dump Information

To display up-line dump information for a device, enter the SHOW CHARACTERISTICS command with the device as the command domain. DECelms displays information about the device, including the following fields. Refer to Section 5.2 for a full description of the SHOW CHARACTERISTICS display for each device.

Upline Dump Switch	The setting of the Up-Line Dump software switch set with the DECelms command SET DUMP SWITCH, as described in Section 2.4.2. When this switch is set to Enabled, the device will request an up-line dump of its memory image and register contents after a fatal error occurs.
Preferred Dump Host	The physical address of the DECnet-VAX host to which the device will send its up-line dump request. The DECelms command SET DUMP HOST enters this information, as described in Section 2.4.3.
Last Dump Host	The physical address of the last DECnet-VAX host, if any, that received an up-line dump request from the device.

In the following example, DECelms was used to enable up-line dumping and instruct the bridge named SUNSHINESKYWAY to send its dump request to the DECnet-VAX host with the physical address AA-00-04-00-32-A3. The same host last received the bridge's up-line dump.

```
ELMS> SHOW SUNSHINESKYWAY CHARACTERISTICS

Show Device Characteristics                   As of: 27-APR-1990 12:06:43
Name: SUNSHINESKYWAY                           Address: 08-00-2B-02-81-03

Node ID (root priority/address):                 128/08-00-2B-02-81-03
Software Implementation Type:                    DEBAM
Software Version:                                1.2
ROM Implementation Type:                         DEBAM
ROM Version:                                     1.2
Hardware Version Number:                         1.0
LAN Bridge 100 Spanning Tree Version:            2
802 Spanning Tree Version:                       0
Max Forwarding Database Entries:                 15871
Max Non-Volatile Forwarding Database Entries:    400
Max Protocol Database Entries:                   64547
Non-Volatile Protocol Database Entries:          300
Forwarding Database Purge Threshold:             15614
Port Count:                                      2
Downline Load Switch:                            Disabled
Downline Load File Name:
Downline Load Physical Switch:                   Disabled
Last Load Host:                                  None
Upline Dump Switch:                              Enabled
Preferred Dump Host:                             AA-00-04-00-32-A3
Last Dump Host:                                  AA-00-04-00-32-A3
Bridge Only Switch:                              Enabled
Reset Defaults Switch:                           Disabled
Port Test Passed Threshold:                      10
```

```
Port Test Interval:                         60
Topology Change Timer:                      0
Manual Filter Switch:                       False
Update Switch                               N/A
Fragmentation Switch                        N/A
```

2.5 Configuring a Bridge for Software Down-Line Loading

This section explains how to configure a LAN Bridge 100, LAN Bridge 150, or LAN Bridge 200 so that it will request a down-line load of software upon initialization instead of loading the bridge software stored in its read-only memory (ROM). The DECbridge 500 does not accept down-line loaded software, but it does accept down-line loaded firmware upgrades, as described in Section 2.6. This section contains the following information:

- Configuring a bridge to be a LAN Traffic Monitor (LTM) listener.
- Enabling and disabling down-line loading
- Specifying the down-line load file
- Displaying down-line load information

NOTE

This section describes software down-line loading. For information on controlling firmware down-line loading, see Section 2.6.

2.5.1 Configuring a Bridge to Be an LTM Listener

LAN Traffic Monitor (LTM) is separately priced Ethernet-monitoring software that uses a LAN Bridge 100 or a LAN Bridge 150 to gather network traffic statistics and periodically forward them to a VMS system for compilation and analysis. (LAN Bridge 200 and DECbridge 500 models do not support LTM, but the LAN Bridge 200 has a built-in LAN monitoring capability. For more information, see Section 5.6.) A bridge that is loaded with LTM monitoring software is called an **LTM listener**. Bridges serving as LTM listeners are dedicated solely to LTM; they do not forward frames or perform other bridge functions.

To configure a bridge to serve as an LTM listener, follow the instructions in the following sections. You must also ensure that a down-line load host has the LTM software installed and has entries in its DECnet node database for each bridge that is designated to be an LTM listener. The LAN Traffic

Monitor documentation and the DECnet-VAX documentation provide instructions for setting up a down-line load host.

NOTE

> Make sure that the bridge address of the target bridge is listed in the node database of the down-line load host. The bridge address is the single address of LAN Bridge 100 models or the line 1 address of LAN Bridge 150 models.

2.5.2 Enabling and Disabling Down-Line Loading

The SET LOAD SWITCH command sets a software switch that controls down-line loading of a LAN Bridge 100, LAN Bridge 150, or LAN Bridge 200. If the hardware switch that causes the bridge to request a down-line load is set to OFF (Disabled), you can enter SET LOAD SWITCH TRUE to override the setting of the hardware switch. When the target bridge receives the command, it will request a down-line load of software upon initialization. If the target bridge is a LAN Bridge 150 or a LAN Bridge 200 that has a password set, you must include PASSWORD and the bridge's password. For example:

```
ELMS> SET TAPPANZEE LOAD SWITCH TRUE PASSWORD SUSPENSION
```

After entering the SET LOAD SWITCH TRUE command, enter INITIALIZE to initialize the bridge and make it request a down-line load of software. Do **not** use the INITIALIZE WITH DEFAULTS command, because it makes the bridge load itself with the bridge software stored in its read-only memory (ROM) instead of requesting a down-line load of software. If the target bridge is a LAN Bridge 150 or a LAN Bridge 200 that has a password set, you must include PASSWORD and the bridge's password. The following example shows the command to initialize the LAN Bridge 150 named TAPPANZEE:

```
ELMS> INITIALIZE TAPPANZEE PASSWORD SUSPENSION
Command will initialize device TAPPANZEE.
After initialization, device 08-00-2B-89-4B-B2 will be loaded
with image
Do you really want to initialize device 08-00-2B-89-4B-B2? YES
```

To make a bridge function as a bridge again when it is currently running down-line loaded software, enter SET LOAD SWITCH FALSE, ensure that the hardware switch that controls down-line loading is set to OFF (Disabled), and then initialize the bridge.

NOTE

> A bridge cannot serve as a bridge unless its down-line load hardware switch is set to OFF (Disabled).

The following commands make the LAN Bridge 150 named TAPPANZEE, currently an LTM listener, serve as a bridge again:

```
ELMS> USE TAPPANZEE
ELMS> SET LOAD SWITCH FALSE PASSWORD SUSPENSION
ELMS> INITIALIZE
```

2.5.3 Specifying the Down-Line Load File

The SET LOAD FILE command specifies the software identification of the file that a LAN Bridge 100, LAN Bridge 150, or LAN Bridge 200 will request from the down-line load host. If you do not specify a file for the bridge to request, the down-line load host will down-line load the default down-line load file stored in its Network Control Program (NCP) database. The software identification of the file must be 10 characters long and conform to the DECnet-VAX file-identification conventions as detailed in the DECnet-VAX documentation. You must enclose the file identification in quotation marks. The following example sets the down-line load file identification for the bridge TAPPANZEE:

```
ELMS> USE TAPPANZEE
ELMS> SET LOAD FILE "LTMLIS1040" PASSWORD SUSPENSION
```

The SET LOAD FILE NONE command clears a previously entered down-line load file identification, indicating that the host should down-line load the default down-line load file. You do not have to enter the SET LOAD SWITCH and SET LOAD FILE commands at the same time or in any particular order.

2.5.4 Displaying Down-Line Load Information

To display down-line load information for a bridge, enter the SHOW CHARACTERISTICS command. DECelms displays information about the bridge, including the following fields:

Downline Load Switch	The setting of the Down-Line Load software switch set with DECelms.
Downline Load File Name	The file identification of the file that the bridge will request from the down-line load host. This information is entered with DECelms.
Downline Load Physical Switch	The setting of the Down-Line Load hardware switch on the bridge.
Last Load Host	The physical address of the last host, if any, that responded to the bridge's request for a down-line load of software. This field applies only to the LAN Bridge 200.

The following example shows the Bridge Characteristics display for a LAN Bridge 100 that is serving as an LTM listener. DECelms was used to override the setting of the hardware switch on the bridge and to indicate that the down-line load host should down-line load LTMLIS1040 instead of the default down-line load file.

```
ELMS> SHOW BAYONNE CHARACTERISTICS

Show Device Characteristics                    As of: 27-APR-1990 13:56:55
Name: BAYONNE                                   Address: 08-00-2B-12-79-BC

Node ID:                                        08-00-2B-12-79-BC
Software Implementation Type:                   LTM
Software Version:                               1.1
Downline Load Switch:                           Enabled
Downline Load File Name:
Downline Load Physical Switch:                  Disabled
ROM Implementation Type:                        DEBET LAN Bridge 100 (Digital)
ROM Version:                                    2.0
```

2.6 Controlling Down-Line Loading of Firmware Upgrades

The SET UPDATE SWITCH command sets a software switch that enables and disables down-line loading of firmware upgrades to a DECbridge 500 or a DECconcentrator 500. This command enables or disables the down-line loading of firmware upgrades, whereas the SET LOAD SWITCH command controls the down-line loading of software to a bridge. The firmware down-line load process deletes the firmware stored in the device's ROM and replaces it with the upgraded firmware.

2.6.1 Setting the Update Software Switch

When you receive a firmware upgrade kit from Digital, read the instructions included with the kit and load the distribution media into the down-line load host. Then enter the SET UPDATE SWITCH TRUE command for the target device. If the target device has a password set, you must include PASSWORD and the device's password. The device will then accept a down-line load of firmware from the down-line load host. Digital recommends that you issue SET UPDATE SWITCH TRUE only when the upgrade tape is installed on the down-line load host.

The following commands instruct the wiring concentrator named NORTHSTATION to accept a firmware upgrade from the down-line load host:

```
ELMS> USE NORTHSTATION
ELMS> SET UPDATE SWITCH TRUE PASSWORD BOSTONGARDEN
```

After the down-line load is complete, issue the SET UPDATE SWITCH FALSE command to prevent down-line loading of firmware upgrades. If the target device has a password set, you must include PASSWORD and the device's password. The following commands prevent down-line loading of firmware to the wiring concentrator NORTHSTATION:

```
ELMS> USE NORTHSTATION
ELMS> SET UPDATE SWITCH FALSE PASSWORD BOSTONGARDEN
```

2.6.2 Displaying the Setting of the Update Software Switch

To display the setting of the Update software switch on a DECbridge 500, enter the SHOW CHARACTERISTICS command with the target bridge as the command domain. In the following example the Update software switch (shown near the bottom of the display) has the default setting, False.

```
ELMS> SHOW BROOKLYN CHARACTERISTICS

Show Device Characteristics              As of: 27-APR-1990 11:19:12
Name: BROOKLYN                             Address: 08-00-2B-0C-1A-A7

Node ID (root priority/address):                128/08-00-2B-0C-1A-A7
Software Implementation Type:                   DEFEB
Software Version:                               1.0
ROM Implementation Type:                        DEFEB
ROM Version:                                    1.0
Hardware Version Number:                        N/A
LAN Bridge 100 Spanning Tree Version:           2
802 Spanning Tree Version:                      0
Max Forwarding Database Entries:                15871
Max Nonvolatile Forwarding Database Entries:    400
Max Protocol Database Entries:                  64547
Nonvolatile Protocol Database Entries:          300
Forwarding Database Purge Threshold:            15614
Port Count:                                     2
Downline Load Switch:                           N/A
Downline Load File Name:                        N/A
Downline Load Physical Switch:                  N/A
Last Load Host:                                 None
Upline Dump Switch:                             Enabled
Preferred Dump Host:                            AA-00-04-00-32-A3
Last Dump Host:                                 AA-00-04-00-32-A3
Bridge Only Switch:                             N/A
Reset Defaults Switch:                          Disabled
Port Test Passed Threshold:                     10
Port Test Interval:                             60
Topology Change Timer:                          0
Manual Filter Switch:                           N/A
Update Switch:                                  False
Fragmentation Switch:                           Enabled
```

2.7 Controlling IP Fragmentation on a DECbridge 500

This section explains how to control the fragmentation of Internet Protocol (IP) frames on a DECbridge 500. It first explains how to enable and disable IP fragmentation and then explains how to display the settings of the software switch that controls IP fragmentation.

2.7.1 Enabling and Disabling IP Fragmentation

The SET FRAGMENTATION SWITCH command sets the Fragmentation switch, a software switch on a DECbridge 500 that controls the fragmentation of Internet Protocol (IP) frames. SET FRAGMENTATION SWITCH ENABLED instructs the bridge to break large Internet Protocol (IP) frames received on its FDDI line into smaller frames that can be transmitted on its Ethernet/IEEE 802.3 line. This fragmentation is necessary because the maximum size for a frame on an FDDI ring is 4500 octets, but only 1518 octets for a frame on an Ethernet/IEEE 802.3 segment. The default setting of the Fragmentation software switch is Enabled.

The DECbridge 500 fragments only IP frames that follow 10-42 encoding, a method of encoding that is sometimes referred to as "10-42 encapsulation" or "Ethernet encapsulation." 10-42 encoded frames are SNAP (Subnetwork Access Protocol) frames that contain the Protocol ID for IP or ARP (Address Resolution Protocol). (In a SNAP frame, the Protocol ID is the first five bytes of the Information field; see Section 4.3.2.3 for more information.) The DECbridge 500 fragments only 10-42 encoded frames that contain the Protocol ID for IP, 00-00-00-08-00. Additionally, the DECbridge 500 does not fragment IP frames encapsulated within the BSD trailer block protocol.

For performance and simplicity reasons, Digital's implementation of IP fragmentation varies slightly from the recommendation RFC-791. The difference is that the DECbridge 500 copies the Record Route and Internet Time Stamp options (if present) in all fragments, not just the first one. Digital provides the Fragmentation software switch so that you can disable IP fragmentation in the event that problems arise from interaction with varying implementations of RFC-791.

SET FRAGMENTATION SWITCH DISABLED prevents fragmentation of oversized IP frames. The bridge discards all frames received on its FDDI line that are larger than the maximum size allowed on an Ethernet/IEEE 802.3 segment. Disabling the Fragmentation software switch may prevent communication with stations that rely on IP fragmentation, but allows all other stations to communicate normally.

The following commands enable the Fragmentation software switch on the bridge TAPPAN_ZEE, instructing it to fragment large IP frames received on its FDDI line into smaller frames that can be transmitted on its Ethernet/IEEE 802.3 line:

```
ELMS> USE TAPPAN_ZEE
ELMS> SET FRAGMENTATION SWITCH ENABLED PASSWORD YONKERS
```

The following command disables the Fragmentation software switch on all the DECbridge 500 models listed in the DECelms registry that do not have a password set. These bridges will discard large IP frames received on their FDDI lines instead of fragmenting them.

```
ELMS> SET KNOWN BRIDGES FRAGMENTATION SWITCH DISABLED
```

2.7.2 Displaying IP Fragmentation Information

To display the setting of the Fragmentation software switch on a DECbridge 500, enter the SHOW CHARACTERISTICS command. DECelms displays information about the bridge, including the following field:

Fragmentation Switch	The setting of the Fragmentation software switch. When Enabled, the bridge breaks large IP frames received on its FDDI line into smaller frames that can be transmitted on its Ethernet/IEEE 802.3 line.

The following example shows the Bridge Characteristics display for a DECbridge 500 that has the default setting, Enabled, for its Fragmentation software switch:

```
ELMS> SHOW DUNBARTON CHARACTERISTICS

Show Device Characteristics                     As of: 27-APR-1990 11:19:12
Name: DUNBARTON                                  Address: 08-00-2B-0C-1A-A7

Node ID (root priority/address):                       128/08-00-2B-0C-1A-A7
Software Implementation Type:                          DEFEB
Software Version:                                      1.0
ROM Implementation Type:                               DEFEB
ROM Version:                                           1.0
Hardware Version Number:                               N/A
LAN Bridge 100 Spanning Tree Version:                  2
802 Spanning Tree Version:                             0
Max Forwarding Database Entries:                       15871
Max Nonvolatile Forwarding Database Entries:           400
Max Protocol Database Entries:                         64547
Nonvolatile Protocol Database Entries:                 300
Forwarding Database Purge Threshold:                   15614
Port Count:                                            2
Downline Load Switch:                                  N/A
Downline Load File Name:                               N/A
Downline Load Physical Switch:                         N/A
Last Load Host:                                        None
Upline Dump Switch:                                    Enabled
Preferred Dump Host:                                   AA-00-04-00-32-A3
Last Dump Host:                                        AA-00-04-00-32-A3
Bridge Only Switch:                                    N/A
Reset Defaults Switch:                                 Disabled
```

```
Port Test Passed Threshold:          10
Port Test Interval:                  60
Topology Change Timer:               0
Manual Filter Switch:                N/A
Update Switch:                       False
Fragmentation Switch:                Enabled
```

The following chapter describes how to manage the lines and physical ports on bridges and wiring concentrators.

3 Managing and Configuring Lines and Physical Ports

This chapter explains how to use DECelms (DEC Extended LAN Management Software) to manage and configure the lines and physical ports on bridges and wiring concentrators. It covers both Ethernet/IEEE 802.3 lines and FDDI lines. The following topics are included:

- Configuring the Line Cost Spanning Tree Parameter
- Setting the CPT Characteristic for a Bridge Line
- Disabling and Enabling Bridge Lines
- Setting the Requested Token Rotation Time for an FDDI Line
- Setting the Maximum Token Rotation Timer for an FDDI Line
- Setting the Valid Transmission Timer for an FDDI Line
- Disabling and Enabling Physical Ports
- Setting the LEM Threshold for a Physical Port

3.1 Configuring the Bridge Line Cost Spanning Tree Parameter

There are many spanning tree parameters associated with each line on a bridge, but Line Cost is the only parameter that you can set. This section discusses Line Cost considerations and then explains how to display and modify the Line Cost parameter.

3.1.1 Line Cost Considerations

Line Cost, the only spanning tree parameter that is set on a per-line basis, establishes a cost factor for each bridge line. The cost is not a monetary cost but is, instead, based on issues such as line bandwidth, anticipated line traffic, and so on. The sum of the line costs on all the bridges on the path to the root represents the bridge's cost to get to the root. For more information on this and other parameters and the spanning tree algorithm, see the *Bridge and Extended LAN Reference* and Section 5.3 of this manual.

The Line Cost parameter must be in the range 1 to 255; the default value is 10. Setting a high line cost reduces the chance that the bridge will become the designated bridge. Bridges with high cost lines also tend to have few descendants in the spanning tree, which reduces the amount of traffic that flows through them. Thus, you can use the Line Cost parameter to influence the outcome of the spanning tree computation process and control the flow of traffic through the extended LAN.

3.1.2 Displaying the Current Line Cost

The SHOW SPANNING CHARACTERISTICS command displays the current setting of the Line Cost parameter. This command also displays many other line parameters, but Line Cost is the only one you can set. (See Section 5.3.2 for a description of the other parameters in the display.) You can display the spanning tree parameters for a specific line or both lines on a specific bridge, or for all bridges that are listed in the DECelms registry. The following commands display the Line Cost and other spanning tree parameters for line 1 on the bridge SAGAMORE. Line Cost is shown as Port Cost in this display.

```
ELMS> USE SAGAMORE LINE 1
ELMS> SHOW SPANNING CHARACTERISTICS

Line Spanning Characteristics for Line 1     As of: 27-APR-1990 11:21:52
Name: SAGAMORE                                Address: 08-00-2B-0C-1A-A7
```

```
Local Network Module State:          FORWARDING
Port Cost:                           10
Designated Bridge ID:                128 /08-00-2B-0C-1A-A7
Designated Bridge Link Number:       1
Designated Bridge Root ID:           10 /08-00-2B-06-25-C7
Root Path Cost:                      40
Designated Root Age:                 0
RTM Flag:                            N/A
Forward Delay Timer:                 0
Bad Hello Count:                     0
Possible Loop Flag:                  False
Topology Changed Flag:               False
Disable Switch:                      Disabled
```

The following commands display the spanning tree parameters for both lines on the bridge SAGAMORE:

```
ELMS> USE SAGAMORE KNOWN LINES
ELMS> SHOW SPANNING CHARACTERISTICS
```

The next example displays the spanning tree parameters for both lines on all bridges that are listed in the DECelms registry. This gives you an overview of how the Line Cost parameter is configured in your extended LAN.

```
ELMS> USE KNOWN BRIDGES KNOWN LINES
ELMS> SHOW SPANNING CHARACTERISTICS
```

3.1.3 Setting the Line Cost

The SET COST command sets the Line Cost for a specific line on a bridge or for both lines on a bridge. SET COST sets the Line Cost for both Ethernet/IEEE 802.3 lines and FDDI lines. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password. The range for Line Cost is 1 to 255; the default value is 10. The following commands set the Line Cost parameter to 15 for line 1 on the bridge SAGAMORE:

```
ELMS> USE SAGAMORE LINE 1
ELMS> SET COST 15 PASSWORD BEACHHOUSE
```

The next example sets the Line Cost to 35 for both lines on the bridge BAYBRIDGE:

```
ELMS> USE BAYBRIDGE
ELMS> SET KNOWN LINES COST 35 PASSWORD ALTERNATIVE
```

3.2 Setting the CPT Characteristic for a Bridge Line

The CPT characteristic informs the bridge whether the transceiver on a bridge line is using the Collision Presence Test (CPT), commonly known as "heartbeat." It applies only to Ethernet/IEEE 802.3 lines, not to FDDI lines. Set the CPT characteristic for a line to Enabled if the line transceiver has CPT or to Disabled if it does not have CPT. The CPT characteristic set to Enabled by default for LAN Bridge 100 and LAN Bridge 150 models. It is set to Disabled by default for the LAN Bridge 200 and the Ethernet/IEEE 802.3 line on a DECbridge 500. This section explains how to display and modify the setting of the CPT characteristic.

3.2.1 Displaying the Current CPT Characteristic Setting

The SHOW CHARACTERISTICS command displays the current setting of the CPT characteristic. This command also displays other line characteristics, which are described in Section 5.2.2.1. You can display the CPT characteristic for a specific line or both lines on a specific bridge, or for both lines on all the bridges listed in the DECelms registry. The following commands display the CPT setting and other characteristics for line 1 on the bridge BROOKLYN. In this example, the Collision Presence Test characteristic was set to Disabled because the transceiver on line 1 does not have the CPT characteristic.

```
ELMS> USE BROOKLYN LINE 1
ELMS> SHOW CHARACTERISTICS

Line Characteristics for Line 1            As of: 27-APR-1990 11:22:06
Name: BROOKLYN                               Address: 08-00-2B-0C-1A-B7

Port Address:                     08-00-2B-0C-1A-B7
Port Number:                      1
Local Network Module State:       FORWARDING
Datalink Type:                    IEEE 802.3 CSMA/CD
Physical Medium Type:             Standard AUI interface ("D" Connector)
Management Sets Allowed Switch:   Enabled
Collision Presence Test Switch:   Disabled
```

The following example displays the CPT setting and other characteristics for both lines on the same bridge:

```
ELMS> USE BROOKLYN KNOWN LINES
ELMS> SHOW CHARACTERISTICS
```

3.2.2 Setting CPT

The SET CPT command enables or disables the CPT characteristic for a specific line on a bridge or for all lines on a bridge. (SET CPT applies only to Ethernet/IEEE 802.3 lines, not to FDDI lines.) If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password. Set the CPT characteristic for a line to ENABLED if the line transceiver uses CPT or to DISABLED if it does not use CPT. The commands in the following example enable the CPT characteristic for line 1 on the bridge BROOKLYN:

```
ELMS> USE BROOKLYN LINE 1
ELMS> SET CPT ENABLED PASSWORD APPLE
```

The next example disables the CPT characteristic for all lines on the bridge named GEORGEWASHINGTON:

```
ELMS> USE GEORGEWASHINGTON
ELMS> SET KNOWN LINES CPT DISABLED PASSWORD GARDENSTATE
```

3.3 Disabling and Enabling Bridge Lines

This section explains how to disable and enable bridge lines. It also explains how to display the current operational state of bridge lines. This material applies to both Ethernet/IEEE 802.3 lines and FDDI lines.

3.3.1 Checking the Operational State of Bridge Lines

To check the operational state of the lines on a bridge, enter the SHOW KNOWN LINES SPANNING CHARACTERISTICS command. DECelms displays the line number and operational state of each line, along with other information that is described in Section 5.3.2. The commands in the following example display the operational state of the lines on the LAN Bridge 200 named OLDNORTH:

```
ELMS> USE OLDNORTH
ELMS> SHOW KNOWN LINES SPANNING CHARACTERISTICS

Line Spanning Characteristics for Line 1  As of: 27-APR-1990 11:21:52
Name: OLDNORTH                              Address: 08-00-2B-0C-1A-A7
```

```
Local Network Module State:           FORWARDING
Port Cost:                            10
Designated Bridge ID:                 128 /08-00-2B-0C-1B-A6
Designated Bridge Link Number:        1
Designated Bridge Root ID:            10 /08-00-2B-06-25-C7
Root Path Cost:                       40
Designated Root Age:                  0
RTM Flag:                             N/A
Forward Delay Timer:                  0
Bad Hello Count:                      0
Possible Loop Flag:                   False
Topology Changed Flag:                False
Disable Switch:                       Disabled

Line Spanning Characteristics for Line 2  As of: 27-APR-1990 11:21:52
Name: OLDNORTH                              Address: 08-00-2B-0C-1A-A7

Local Network Module State:           DISABLED
Port Cost:                            10
Designated Bridge ID:                 128 /08-00-2B-0C-1B-A6
Designated Bridge Link Number:        1
Designated Bridge Root ID:            10 /08-00-2B-06-25-C7
Root Path Cost:                       40
Designated Root Age:                  0
RTM Flag:                             N/A
Forward Delay Timer:                  0
Bad Hello Count:                      0
Possible Loop Flag:                   False
Topology Changed Flag:                False
Disable Switch:                       Disabled
```

The display shows that line 1 on OLDNORTH is in FORWARDING, the normal operational state, whereas line 2 was disabled with the DECelms command DISABLE.

3.3.2 Disabling Bridge Lines

The DISABLE command prevents any further forwarding on a bridge Ethernet/IEEE 802.3 or FDDI line. For the LAN Bridge 100 and LAN Bridge 150 models, it also initializes the bridge. (Section 2.2 and the *Bridge and Extended LAN Reference* describe bridge initialization.) Enabling and disabling bridge lines is one of the primary means of controlling the logical network topology created by the spanning tree computation process.

You can disable a specific line on a bridge or both lines on a bridge. When disabling a line, you must specify the bridge that contains the target line. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's

password. The following commands disable line 1 on the bridge named MYSTICTOBIN:

```
ELMS> USE MYSTICTOBIN LINE 1
ELMS> DISABLE PASSWORD WONDERLAND

DISABLE PORT command will cause the device to be initialized.
Do you really want to initialize device 08-00-2B-04-8A-21 ? YES
```

The following commands disable both lines on the LAN Bridge 200 named WHITESTONE:

```
ELMS> USE WHITESTONE
ELMS> DISABLE KNOWN LINES PASSWORD SUBURBAN
```

3.3.3 Enabling Bridge Lines

The ENABLE command restarts forwarding activity on a bridge Ethernet/IEEE 802.3 or FDDI line. For the LAN Bridge 100 and LAN Bridge 150 models, it also initializes the bridge. (Section 2.2 and the *Bridge and Extended LAN Reference* describe bridge initialization.) The line enters the PREFORWARDING state for a short time to perform loop detection tests and to learn about the stations on its LAN, then automatically enters the FORWARDING state. Use this command to restore a previously disabled line to normal operation. Enabling and disabling bridge lines is one of the primary means of controlling the logical network topology created by the spanning tree computation process.

You can enable a specific line on a bridge or both lines on a bridge. When enabling a line, you must specify the bridge that contains the target line. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password. The following commands enable line 1 on the LAN Bridge 150 named THROGSNECK:

```
ELMS> USE THROGSNECK LINE 1
ELMS> ENABLE PASSWORD SUBDIVISION

ENABLE PORT command will cause the device to be initialized.
Do you really want to initialize device 08-00-2B-14-2A-21 ? YES
```

The following commands enable both lines on the LAN Bridge 200 named GOLDENGATE:

```
ELMS> USE GOLDENGATE
ELMS> ENABLE KNOWN LINES PASSWORD LIFESTYLE
```

3.4 Setting the Requested Token Rotation Time for an FDDI Line

This section explains how to set the token rotation time (the ANSI FDDI parameter T_Req) that the FDDI MAC entity of a DECbridge 500 or DECconcentrator 500 will request in the claim token process. It also describes how to display the current requested token rotation time (TRT) setting.

3.4.1 Setting the Requested TRT

The SET REQUESTED TRT command sets the TRT value that the FDDI MAC entity of a DECbridge 500 or DECconcentrator 500 will bid in the claim token process. (This value is referred to as T_Req in the ANSI X3.139-1987 specification, which defines the MAC entity for FDDI.) The claim token process sets the target token rotation time (TTRT) used by all stations on the ring and determines the station that will originate the token. (TTRT is the ANSI FDDI parameter T_Neg.) SET REQUESTED TRT sets the value that a station will bid for in its claim frames. The station with the lowest requested TRT value, longest address, and highest address wins the claim token process. The winning station establishes its requested TRT value as the target token rotation time (TTRT) and initializes the token.

The legal range for requested TRT is 4.0 milliseconds to 1342.1568 milliseconds. The default value is 8.0 milliseconds. The requested TRT value for a station must be less than or equal to its maximum TRT value.

Digital recommends that you leave requested TRT at its default value of 8.0 milliseconds on all stations unless you have a clearly defined reason for setting a different value. A higher requested TRT value increases the efficiency of the ring, but also increases the access delay. For most networks, 8 milliseconds is the best compromise between high efficiency and rapid access time.

For both the DECbridge 500 and the DECconcentrator 500, you must specify line 1 as the command domain, since that is the FDDI line. If the target bridge or wiring concentrator has a password set, you must enter PASSWORD and the device's password.

The commands in the following example set the requested token rotation time to 10.0 milliseconds for the DECconcentrator 500 named GRANDCENTRAL. This is the target token rotation time (TTRT) that GRANDCENTRAL will bid for in the claim token process.

```
ELMS> USE GRANDCENTRAL LINE 1
ELMS> SET REQUESTED TRT 10 PASSWORD CELESTIAL
```

The following command sets the requested TRT to 6.0 milliseconds for the DECbridge 500 named SUNSHINESKYWAY:

```
ELMS> SET SUNSHINESKYWAY LINE 1 REQUESTED TRT 6 PASSWORD ALLIGATOR
```

3.4.2 Displaying the Current Requested TRT Setting

The SHOW CHARACTERISTICS command displays the requested token rotation time setting for a DECbridge 500 or DECconcentrator 500. You must specify line 1 as the command domain, since that is the FDDI line. In the following example, the requested TRT on the DECconcentrator 500 GRANDCENTRAL is set to 8.0 milliseconds.

```
ELMS> SHOW GRANDCENTRAL LINE 1 CHARACTERISTICS

Line Characteristics for Line 1    As of: 27-APR-1990 11:22:06
Name: GRANDCENTRAL                  Address: 08-00-2B-0C-1A-A7

Link Address:                     08-00-2B-0C-1A-A7
Port Number:                      1
Datalink Version:                 1.0
Datalink Type:                    FDDI
Station ID:                       00-00-08-00-2B-0C-1A-A7
Station Type:                     Dual Attachment Concentrator
Management Sets Allowed Switch:   Enabled
Port Broken Reason:
Maximum TRT:                      173.0150 ms
Requested TRT:                    8.0 ms
Valid Transmission Time:          2.6214 ms
SMT Version ID:                   1.0
Path Latency Ring One:            0.01080 ms
Path Latency Ring Two:            0.00112 ms
SMT Resource Index:               11
Frame Strip Mode:                 SA Match
```

3.5 Setting the Maximum Token Rotation Timer for an FDDI Line

This section explains how to set the maximum token rotation timer for the FDDI MAC entity of a DECbridge 500 or a DECconcentrator 500 and describes how to display the current maximum token rotation timer setting.

3.5.1 Setting the Maximum TRT

The SET MAXIMUM TRT command sets the maximum token rotation time (TRT) for the FDDI MAC entity of a DECbridge 500 or a DECconcentrator 500. (Maximum token rotation time is referred to as T_Max in the ANSI X3.139-1987 specification, which describes the MAC entity for FDDI.) A station's maximum TRT value serves two major purposes. First, it is the maximum target token rotation time (TTRT) that the station will allow to be negotiated in the claim token process. (TTRT is the ANSI FDDI parameter T_Neg.) The resulting TTRT value serves as the TRT timer value for all stations on the ring. The stations use the TRT timer to control ring scheduling during normal operation and to detect and recover from serious ring errors.

Secondly, the maximum TRT value controls station operation during the claim token process itself. If the station has stopped bidding and is waiting for some other station to initialize the ring, the station resumes bidding when its maximum TRT expires. If maximum TRT expires when the station is still bidding, the claim token process has failed to recover the ring. The station enters the beacon process, a more drastic recovery procedure.

The legal range for maximum TRT is 167.77216 milliseconds to 1336.9344 milliseconds. The default value is 173.0150 milliseconds. The maximum TRT value for a station must be greater than or equal to its requested TRT value.

For both the DECbridge 500 and the DECconcentrator 500, you must specify line 1 as the command domain, since that is the FDDI line. If the target bridge or wiring concentrator has a password set, you must enter PASSWORD and the device's password.

The commands in the following example set the maximum token rotation time to 198.8 milliseconds for the DECconcentrator 500 named GRANDCENTRAL. This is the maximum target token rotation time (TTRT) that GRANDCENTRAL will allow to be negotiated during the claim token process, and the value that GRANDCENTRAL will use for its own TRT timer during the claim token process.

```
ELMS> USE GRANDCENTRAL LINE 1
ELMS> SET MAXIMUM TRT 198.8 PASSWORD CELESTIAL
```

The following command sets maximum TRT to 350.0 milliseconds for the DECbridge 500 named SUNSHINESKYWAY:

```
ELMS> SET SUNSHINESKYWAY LINE 1 MAXIMUM TRT 350 PASSWORD ALLIGATOR
```

3.5.2 Displaying the Current Maximum TRT Setting

The SHOW CHARACTERISTICS command displays the current maximum token rotation time setting for a DECbridge 500 or DECconcentrator 500. You must specify line 1 as the command domain, since that is the FDDI line. In the following example, the maximum token rotation time on the DECconcentrator 500 GRANDCENTRAL is set to 173.0150 milliseconds, the default value.

```
ELMS> SHOW GRANDCENTRAL LINE 1 CHARACTERISTICS

Line Characteristics for Line 1    As of: 27-APR-1990 11:22:06
Name: GRANDCENTRAL                   Address: 08-00-2B-0C-1A-A7

Link Address:                     08-00-2B-0C-1A-A7
Port Number:                      1
Datalink Version:                 1.0
Datalink Type:                    FDDI
Station Type:                     Dual Attachment Concentrator
Station ID:                       00-00-08-00-2B-0C-1A-A7
Management Sets Allowed Switch:   Enabled
Port Broken Reason:
Maximum TRT:                      173.0150 ms
Requested TRT:                    8.0 ms
Valid Transmission Time:          2.6214 ms
SMT Version ID:                   1.0
Path Latency Ring One:            0.01080 ms
Path Latency Ring Two:            0.00112 ms
SMT Resource Index:               11
Frame Strip Mode:                 SA Match
```

3.6 Setting the Valid Transmission Timer for an FDDI Line

This section explains how to set value for the valid transmission timer (TVX) for the FDDI MAC entity of a DECbridge 500 or DECconcentrator 500 and describes how to display the value that is currently in effect.

3.6.1 Setting the Valid Transmission Time

The SET VTX command sets the valid transmission time for the FDDI MAC entity of a DECbridge 500 or a DECconcentrator 500. Each FDDI station has a valid transmission timer (TVX) that detects token loss on the ring, excessive noise, and other faults. The station resets its valid transmission

timer to zero upon receipt of the ending delimiter of a valid frame or nonrestricted token. The timer expires when the time since the last valid transmission exceeds the TVX value set for the station. When the valid transmission timer expires, the station starts the claim token process, which initalizes the ring and creates a new token.

The legal range for the valid transmission timer is 2.35 milliseconds to 5.224 milliseconds. The default value is 2.6214 milliseconds.

For both the DECbridge 500 and the DECconcentrator 500, you must specify line 1 as the command domain, since that is the FDDI line. If the target bridge or wiring concentrator has a password set, you must enter PASSWORD and the device's password.

The commands in the following example set the valid transmission time to 3.4 milliseconds on the DECconcentrator 500 named GRANDCENTRAL. GRANDCENTRAL will start the claim token process to initialize the ring if more than 3.4 milliseconds pass without receipt of a valid frame or nonrestricted token.

```
ELMS> USE GRANDCENTRAL LINE 1
ELMS> SET TVX 3.4 PASSWORD CELESTIAL
```

The following command sets the valid transmission time 2.8 milliseconds on the DECbridge 500 named JAMESRIVER:

```
ELMS> SET JAMESRIVER LINE 1 TVX 2.8 PASSWORD POCAHONTAS
```

3.6.2 Displaying the Current Valid Transmission Time Setting

The SHOW CHARACTERISTICS command displays the valid transmission time in effect for a DECbridge 500 or DECconcentrator 500. You must specify line 1 as the command domain, since that is the FDDI line. In the following example, the valid transmission time on the DECconcentrator 500 GRANDCENTRAL is set to 2.6214 milliseconds.

```
ELMS> USE GRANDCENTRAL LINE 1
ELMS> SHOW CHARACTERISTICS

Line Characteristics for Line 1    As of: 27-APR-1990 11:22:06
Name: GRANDCENTRAL                  Address: 08-00-2B-0C-1A-A7
```

```
Link Address:                      08-00-2B-0C-1A-A7
Port Number:                       1
Datalink Version:                  1.0
Datalink Type:                     FDDI
Station ID:                        00-00-08-00-2B-0C-1A-A7
Station Type:                      Dual Attachment Concentrator
Management Sets Allowed Switch:    Enabled
Port Broken Reason:
Maximum TRT:                       173.0150 ms
Requested TRT:                     8.0 ms
Valid Transmission Time:           2.6214 ms
SMT Version ID:                    1.0
Path Latency Ring One:             0.01080 ms
Path Latency Ring Two:             0.00112 ms
SMT Resource Index:                11
Frame Strip Mode:                  SA Match
```

3.7 Enabling and Disabling DECconcentrator 500 Physical Ports

This section explains how to enable and disable a DECconcentrator 500 physical port. It also describes how to check the operational state of a physical port on a DECbridge 500 or a DECconcentrator 500.

NOTE

You cannot enable and disable **just** the physical port on a DECbridge 500. However, you can enable and disable the FDDI line (line 1) as described in Section 3.3. This enables and disables the entire FDDI line, including both the MAC entity and the PHY entity (physical port).

3.7.1 Disabling Physical Ports

When a DECconcentrator 500 physical port is the command domain, the DISABLE command shuts down the physical port. You would use this command to disable a physical port that is oscillating between the BROKEN and INITIALIZING states, as shown in the SHOW STATUS display (see Section 5.1.3). A physical port that is oscillating also has high values for the LEM Rejects and LCT Rejects counters shown in the SHOW COUNTERS display (see Section 5.4.3). A high LCT Rejects counter value indicates frequent failure of the link confidence test (LCT), which measures the quality of the physical port before connecting it to the ring. A high LEM Rejects

counter value indicates that the physical port frequently exceeded the cut-off threshold of the link error monitor (LEM), which measures the quality of the physical port during use.

If the target wiring concentrator has a password set, you must include PASSWORD and the wiring concentrator's password. The commands in the following example disable physical port 4C on the wiring concentrator GRANDCENTRAL:

```
ELMS> USE GRANDCENTRAL PHYPORT 4C
ELMS> DISABLE PASSWORD CELESTIAL
```

The following command disables physical port 3B on the wiring concentrator SOUTHSTATION:

```
ELMS> DISABLE SOUTHSTATION PHYPORT 3B PASSWORD TEAPARTY
```

3.7.2 Enabling Physical Ports

The ENABLE command reenables a physical port that was disabled with the DISABLE command. If the target wiring concentrator has a password set, you must include PASSWORD and the wiring concentrator's password. The commands in the following example enable physical port 4C on the wiring concentrator GRANDCENTRAL:

```
ELMS> USE GRANDCENTRAL PHYPORT 4C
ELMS> ENABLE PASSWORD CELESTIAL
```

The following command enables physical port 3B on the wiring concentrator SOUTHSTATION:

```
ELMS> ENABLE SOUTHSTATION PHYPORT 3B PASSWORD TEAPARTY
```

3.7.3 Checking the Operational State of a Physical Port

The SHOW STATUS command displays the current operational state of a physical port on a DECbridge 500 or DECconcentrator 500. If the Physical Port State field has the value OFF READY, the physical port is disabled. Any other value indicates that the physical port is enabled, but not necessarily operational. In the example below, the physical port was disabled by the DECelms command DISABLE:

```
ELMS> SHOW NORTHSTATION PHYPORT 4C STATUS

Phy Port Status for Port 4c                  As of: 27-APR-1990 11:22:06
Name: NORTHSTATION                            Address: 08-00-2B-0C-1A-A7

Physical Port State:              OFF READY
Neighbor Physical Port Type:      Unknown
Reject Reason:
Physical Link Error Estimate:     5
```

3.8 Setting the LEM Threshold for a Physical Port

This section explains how to set the LEM threshold for a physical port (PHY entity) on a DECbridge 500 or a DECconcentrator 500 and describes how to display the current LEM threshold setting.

3.8.1 Setting the LEM Threshold

The SET LEM THRESHOLD command sets the link error monitor (LEM) threshold for a physical port on a DECbridge 500 or a DECconcentrator 500. The LEM monitors the bit error rate (BER) on the physical port during normal operation. When the bit error rate rises above the LEM threshold, the station disables the physical port, preventing it from disrupting the ring. The station then repeatedly runs the link confidence test (LCT) on the physical port until the physical port passes. The bit error rate on a physical port may rise because of marginal port quality, port degradation, or simply because the connector is loose or unplugged.

The LEM threshold is expressed as the absolute value of the exponent of the bit error rate. The legal range for the threshold is 5 through 8, corresponding to the range of bit error rates, which is 10 to the -5th (0.00001) bit errors per second through 10 to the -8th (0.00000001) bit errors per second. The value 5 instructs the station to tolerate a relatively high bit error rate on the physical port without disabling it. The value 8 instructs the station to disable the physical port on the first sign of trouble. The default value is 8.

The commands in the following example set the LEM threshold to 10 to the -7th for physical port 2B on the wiring concentrator PENNSTATION. PENNSTATION will disable the physical port if the bit error rate exceeds 0.0000001 errors per second.

```
ELMS> USE PENNSTATION PHYPORT 2B
ELMS> SET LEM THRESHOLD 7 PASSWORD FELTFORUM
```

The following command sets the LEM threshold to 10 to the -5th for the physical port on the DECbridge 500 named RIPVANWINKLE:

```
ELMS> SET RIPVANWINKLE PHYPORT 1 LEM THRESHOLD 5 PASSWORD FORTYWINKS
```

3.8.2 Displaying the Current LEM Threshold

The SHOW CHARACTERISTICS command displays the LEM threshold in effect for a physical port. In the following example, the LEM threshold is set to 10 to the -6th (0.000001):

```
ELMS> USE SOUTHSTATION PHYPORT 3B
ELMS> SHOW CHARACTERISTICS

Phy Port Characteristics for Port 3b          As of: 27-APR-1990 11:22:06
Name: SOUTHSTATION                             Address: 08-00-2B-0C-1A-A7

Physical Port Type:                 Master
LEM Threshold:                      6
PMD Type:                           Multi Mode
```

4

Managing Bridge Address and Protocol Filtering

This chapter explains how to use DECelms (DEC Extended LAN Management Software) to manage bridge address and protocol filtering. It contains the following information:

- Managing Address Filtering
- Managing LAN Bridge 200 and DECbridge 500 Address Filtering
- Managing Protocol Filtering

4.1 Managing Address Filtering

This section describes the forwarding database and explains how to use DECelms to display, add, modify, and remove forwarding entries.

NOTE

The information in this section applies to all Digital bridges. However, the LAN Bridge 200 and DECbridge 500 models have additional address filtering functionality that is described in Section 4.2. The LAN Bridge 200 and DECbridge 500 models can also filter frames based on their protocol type, as described in Section 4.3.

4.1.1 The Forwarding Database

The main function of a bridge is **filtering** network traffic by keeping local traffic local and forwarding only those frames destined for the other side of the bridge. The bridge filters traffic by maintaining a **forwarding database**. The forwarding database contains a list of addresses, the bridge line through which they can be reached, and other status information. These **address entries** are added and maintained either by the bridge's learning process or by DECelms commands. The *Bridge and Extended LAN Reference* contains a complete description of the forwarding database and learning process. This section explains the operation of the forwarding database and describes the types of forwarding entries.

The Bridge Learning Process: The bridge listens to network traffic to acquire a working knowledge of which stations can be reached through each of its lines. The bridge learns this information by reading the source addresses of incoming frames and noting the line through which the frame entered. Thus, the bridge associates each station address that it hears with one of its lines.

Use of the Forwarding Database: When the bridge receives a frame, it looks up the destination address in its forwarding database. If there is no entry for the address, the bridge forwards the frame. If the frame came in on the same line that the forwarding entry indicates it should go out on, the bridge discards the frame because it is already on the right side of the bridge. The bridge forwards the frame if the forwarding entry indicates that it is destined for the other side of the bridge. Thus, the bridge conserves network utilization by keeping local traffic local. With DECelms, you can add entries to control the disposition of frames sent to specific physical and multicast addresses, as described in the Management Entries section that follows.

Aging of Entries: The entries added by the learning process are held only in volatile memory; they are lost whenever the bridge is initialized. Entries are also **aged** out of the forwarding database. If the bridge does not see an entry's address in the source address of a frame for a certain period of time, the bridge marks the entry as inactive. These **inactive entries** remain in the database until the bridge purges them. The bridge purges the forwarding database when the number of active and inactive entries reaches the threshold set for the bridge. (The purging threshold is not configurable.)

Setting the Aging Time: Two spanning tree parameters determine the aging time for a bridge's forwarding database. You can set both of them with the DECelms command SET SPANNING CHARACTERISTICS, as described in Section 2.3. The Normal Aging Time parameter controls how long the bridge keeps inactive entries. The range is 15 to 945 seconds (about 15 minutes); the default is 2 minutes. The Short Aging Time parameter has the same effect, except that it controls the aging time immediately after a topology change. The range is 15 to 255 seconds; the default is 30 seconds. See Section 2.3.2 and the *Bridge and Extended LAN Reference* for more information on these parameters.

Management Entries: Management entries are forwarding entries added with the DECelms command ADD ADDRESS. DECelms normally enters management entries in both the bridge's nonvolatile memory (NVRAM) and volatile memory. These entries are called **permanent entries** because they are preserved even in the event of a shutdown or power failure. However, if NVRAM is filled, DECelms adds new management entries only in volatile memory. Entries stored only in volatile memory are lost if the bridge loses power. All management entries are permanent in the sense that they are immune from the aging process that clears out inactive learned entries.

For physical address entries, you can use DECelms to set the outbound line for frames sent to the address. Alternatively, you can control the **disposition** of frames sent to the address by instructing the bridge to forward or filter (discard) them. By making an entry for a station with the disposition FILTER, you can prevent access to the station from the other side of the bridge. By making widespread use of this feature, you can divide your extended LAN into separate districts to reduce network traffic or enforce security.

With DECelms, you can also add multicast addresses to the forwarding database, but only to instruct the bridge to forward or filter (discard) frames sent to the address. This regionalizes the multicast frames, because they are restricted to one part of the extended LAN.

4.1.2 Displaying Address Entries

The SHOW PHYSICAL ADDRESSES and SHOW MULTICAST ADDRESSES commands display the forwarding entries for a specific bridge or for all bridges listed in the DECelms registry as determined by the command domain. If you include the TO *file-spec* phrase, DECelms sends the output to the specified file rather than displaying it on your screen. (You can supply the directory and file name, but not the node name or the device name.) You can display all the physical address entries or multicast address entries in the forwarding database or only certain types of address entries, as described in Section 4.1.2.3.

4.1.2.1 Displaying All the Physical Address Entries

The SHOW KNOWN PHYSICAL ADDRESSES command displays all the physical address entries in the forwarding database of a bridge. The following command displays all the physical address entries in the forwarding database for the bridge DUNBARTON; the example also shows five entries of the resulting display:

```
ELMS> SHOW DUNBARTON KNOWN PHYSICAL ADDRESSES

Known Physical Address Entries                   As of: 27-APR-90 16:40:40
Name: DUNBARTON                                Address: 08-00-2B-12-23-13

Address            Outbound  Last     Disposition     Set by      Aging
                   Line      Seen
                             On Line

08-00-2B-12-34-44  NONE      NONE     SELF            SELF        FIXED
AA-00-04-00-12-34  NONE      NONE     FILTER          MANAGEMENT  FIXED
AA-00-04-00-12-33   2        NONE     FIXED LINE 2    MANAGEMENT  FIXED
AA-00-04-00-12-22   1         1       LEARNED LINE 1  LEARNING    DYNAMIC
AA-00-04-00-3F-A1  NONE      NONE     INACTIVE        LEARNING    DYNAMIC
```

The fields of this display are:

Address	The physical address of the entry in hexadecimal format. The least significant bit of the leftmost byte is even for a physical address and odd for a multicast address.

Outbound Line	For managment entries added with the DECelms command ADD ADDRESS *nn-nn-nn-nn-nn-nn* LINE *n*, the line on which the bridge is instructed to forward frames sent to this address. For learned entries, the line on which the bridge will forward frames sent to this address. DECelms displays NONE in this field for inactive entries and management entries set to FILTER. For management entries set to FORWARD, DECelms displays Active Lines in this field.
Last Seen On Line	For learned entries, the line on which the bridge last heard a frame with this **source** address (in other words, a frame sent from the station with this address). DECelms displays NONE in this field for inactive entries and management entries.
Disposition	How the bridge will dispose of frames sent to this address. For learned entries, the disposition is LEARNED LINE *n*, where *n* is the line on which the bridge will forward frames sent to the address of the entry. DECelms displays INACTIVE in this field for inactive entries or SELF for the bridge's own address. For management entries, the dispositon is either FILTER, FORWARD, or FIXED LINE *n*, where *n* is the line on which the bridge is instructed to forward frames sent to the address of the entry.
Set by	How the address was entered into the forwarding database. SELF indicates that the bridge added its own address during initialization. LEARNING indicates that the address was added by the bridge's own learning process. MANAGEMENT addresses were added by the DECelms command ADD ADDRESS.
Aging	Indicates whether the entry is subject to aging. This field always reads DYNAMIC for learned entries (because they are subject to aging) and FIXED for management entries (because they are immune from the aging process). An exception is the bridge's address for itself, which is entered in the forwarding database by the bridge but is immune from aging.

The following paragraphs describe the five entries in the preceding example of the SHOW ADDRESSES display.

The following entry is for the bridge DUNBARTON itself; it is DUNBARTON's address. DUNBARTON retains and processes frames sent to itself, because they generally contain management commands and spanning tree messages.

Address	Outbound Line	Last Seen On Line	Disposition	Set by	Aging
08-00-2B-12-34-44	NONE	NONE	SELF	SELF	FIXED

The following entry was added by the DECelms command ADD ADDRESS AA-00-04-00-12-34 DISPOSITION FILTER. It instructs DUNBARTON to filter (discard) frames sent to this address. If the entry had been set to FORWARD, DECelms would display Active Lines in the Outbound Line field and FORWARD in the Disposition field.

Address	Outbound Line	Last Seen On Line	Disposition	Set by	Aging
AA-00-04-00-12-34	NONE	NONE	FILTER	MANAGEMENT	FIXED

The following entry was added by the DECelms command ADD ADDRESS AA-00-04-00-12-33 LINE 2. It instructs DUNBARTON to forward frames sent to this address on line 2.

Address	Outbound Line	Last Seen On Line	Disposition	Set by	Aging
AA-00-04-00-12-33	2	NONE	FIXED LINE 2	MANAGEMENT	FIXED

The following entry was added by DUNBARTON's learning process after DUNBARTON received a frame on line 1 with AA-00-04-00-12-22 in the source address field. The aging for this entry is dynamic, because DUNBARTON will mark the entry inactive if it does not receive another frame from this address within the aging time set for its forwarding database.

Address	Outbound Line	Last Seen On Line	Disposition	Set by	Aging
AA-00-04-00-12-22	1	1	LEARNED LINE 1	LEARNING	DYNAMIC

The following entry is now INACTIVE because DUNBARTON did not see the entry's address in the source address field of a frame during the time specified by its Normal Aging Time parameter or Short Aging Time parameter. DUNBARTON will delete this entry the next time it purges its forwarding database. (See Section 2.3.4 for more information on the Aging Time parameters.)

Address	Outbound Line	Last Seen On Line	Disposition	Set by	Aging
AA-00-04-00-3F-A1	NONE	NONE	INACTIVE	LEARNING	DYNAMIC

4.1.2.2 Displaying All the Multicast Address Entries

The SHOW KNOWN MULTICAST ADDRESSES command displays all the multicast address entries in the forwarding database of a bridge. The following command displays all the multicast address entries in the forwarding database for the bridge DUNBARTON; the example also shows four entries of the resulting display:

```
ELMS> SHOW DUNBARTON KNOWN MULTICAST ADDRESSES

KNOWN Multicast Forwarding Entries            As of: 27-APR-90 16:40:40
Name: DUNBARTON                                 Address: 08-00-2B-12-23-13

Multicast Address    Disposition
FF-FF-FF-FF-FF-FF     FORWARD
09-00-2B-01-00-01     KEEP
09-00-03-44-33-A2     FORWARD
01-80-C2-00-00-08     FILTER
```

The fields of this display are:

Multicast Address	The multicast address of the entry in hexadecimal format. The least significant bit of the leftmost byte is even for a physical address and odd for a multicast address.
Disposition	How the bridge will dispose of frames sent to this address. FORWARD indicates that the bridge will forward frames sent to the address of the entry; FILTER indicates that it will discard them. DECelms displays KEEP in this field for the known bridges multicast address because the bridge will process those frames.

4.1.2.3 Displaying Specific Types of Entries or Addresses

You can tailor the SHOW PHYSICAL ADDRESSES and SHOW MULTICAST ADDRESSES commands to display only the types of entries described in Table 4–1.

Table 4–1: Types of Forwarding Database Address Entries

Address Entry Type	Description
KNOWN	All the physical or multicast addresses listed in the forwarding database.
MANAGEMENT	Addresses added by the DECelms command ADD ADDRESS.
PERMANENT	Management addresses that are stored in the bridge's nonvolatile memory (NVRAM). If the bridge's NVRAM is full, this may be a subset of MANAGEMENT ADDRESSES.
LEARNED	Addresses entered by the bridge's learning process.
INACTIVE	Learned addresses that the bridge has marked inactive but not yet purged. The bridge marks an address entry as inactive if it does not see the entry's address in the Source Address field of a frame within the aging time set for the bridge. This type does not apply to multicast addresses.

The following commands display all the multicast addresses in the bridge DUNBARTON's forwarding database:

```
ELMS> USE DUNBARTON
ELMS> SHOW KNOWN MULTICAST ADDRESSES
```

The following commands send all the management and permanent entries in the bridge SANMATEO's forwarding database to separate files. Any management entries that do not appear in the file of permanent entries were entered only in SANMATEO's volatile memory because there was not enough room in its NVRAM.

```
ELMS> USE SANMATEO
ELMS> SHOW MANAGEMENT PHYSICAL ADDRESSES TO SANMATEO.MNGMT
ELMS> SHOW MANAGEMENT MULTICAST ADDRESSES TO SANMATEO.MNGMT
ELMS> SHOW PERMANENT PHYSICAL ADDRESSES TO SANMATEO.PERM
ELMS> SHOW PERMANENT MULTICAST ADDRESSES TO SANMATEO.PERM
```

The following commands display the addresses that SANMATEO's learning process added to its forwarding database:

```
ELMS> SHOW LEARNED PHYSICAL ADDRESSES
ELMS> SHOW LEARNED MULTICAST ADDRESSES
```

The next commands display the management addresses that were added to the forwarding databases of bridges throughout the extended LAN:

```
ELMS> USE KNOWN BRIDGES
ELMS> SHOW MANAGEMENT PHYSICAL ADDRESSES
ELMS> SHOW MANAGEMENT MULTICAST ADDRESSES
```

4.1.3 Displaying the Forwarding Entry for a Specific Address

The SHOW ADDRESS command displays the forwarding entry for a specific physical or multicast address. The commands can display the entry for an address in the forwarding database of a specific bridge or in the forwarding databases of all bridges listed in the DECelms registry, depending on the command domain.

The following command displays the entry for the physical address AA-00-04-33-33-55 in the forwarding database of the bridge BOURNE:

```
ELMS> SHOW BOURNE ADDRESS AA-00-04-33-33-55

Forwarding Entry                                As of: 27-APR-90 18:22:50
Name: BOURNE                                  Address: 08-00-2B-06-53-27

Forwarding Entry:   AA-00-04-33-33-55
Set by:             LEARNING
Outbound Line:      2
Last Seen on Line:  2
Disposition:        LINE 2
Aging:              DYNAMIC
```

The first 5 fields of this display are the same as those for the SHOW ADDRESSES command, described in Section 4.1.2.1. The sixth field, Aging, is set to DYNAMIC (enabled) if the entry was added by the bridge's learning process. The Aging field is set to FIXED if the entry was added by the DECelms command ADD ADDRESS because management entries are not subject to aging. In the preceding example, the entry for the address was added by the bridge BOURNE's learning process, so aging is automatically enabled (DYNAMIC).

The following commands display the forwarding entry for the physical address AA-00-04-33-44-55 in the bridge SAGAMORE's forwarding database:

```
ELMS> USE SAGAMORE
ELMS> SHOW ADDRESS AA-00-04-33-44-55

Forwarding Entry                                As of: 27-APR-90 18:22:50
Name: SAGAMORE                                Address: 08-00-2B-06-53-32
```

```
Forwarding Entry:  AA-00-04-33-44-55
Set by:            MANAGEMENT
Outbound Line:     1
Last Seen on Line: NONE
Disposition:       FIXED LINE 1
Aging:             FIXED
```

Aging was automatically disabled (FIXED) for this entry because it was entered with the DECelms command ADD ADDRESS. The display reveals a problem, however, because the outbound line was set to line 1 with DECelms, whereas SAGAMORE last heard the station transmitting on line 2. This discrepancy prevents the station with the address AA-00-04-33-44-55 from receiving traffic across the bridge SAGAMORE. (DECelms displays LEARNED in the Disposition field because the disposition of the entry was not set with DECelms.)

The next example displays a multicast address entry from the bridge SAGAMORE's forwarding database. No domain information is given, because the default domain was set to be the bridge SAGAMORE in the preceding example.

```
ELMS> SHOW ADDRESS 09-00-03-44-33-55

Forwarding Entry                          As of: 27-APR-90 18:22:50
Name: SAGAMORE                          Address: 08-00-2B-06-53-27

Forwarding Entry:  09-00-03-44-33-55
Set by:            MANAGEMENT
Outbound Line:     NONE
Last Seen on Line: NONE
Disposition:       FILTER
Aging:             FIXED
```

This entry was entered by network management with the ADD ADDRESS command. It instructs the bridge to discard frames sent to the multicast address 09-00-03-44-33-55.

You can also display the entry for an address in the forwarding database of every bridge listed in the DECelms registry. This gives you a global picture of the forwarding information set for the address throughout the extended LAN. For example:

```
ELMS> USE KNOWN BRIDGES
ELMS> SHOW ADDRESS AA-00-04-33-12-46
```

4.1.4 Adding Forwarding Entries

You can use DECelms to add entries for physical and multicast addresses to a bridge's forwarding database. DECelms places the entries in volatile memory and in NVRAM if there is enough room, so that they will be saved even if the bridge is powered down or initialized. All entries added with DECelms, even those that are entered only in volatile memory, are immune from the aging process that marks inactive learned entries to be purged. Section 4.1.4.1 and Section 4.1.4.2 explain how to add physical and multicast address entries to the forwarding database of a bridge.

4.1.4.1 Adding a Physical Address Entry

The ADD ADDRESS command adds a physical or multicast address entry to the forwarding database of a bridge. To add an entry for a physical address, you must enter the address as 12 hexadecimal digits in the form *nn-nn-nn-nn-nn-nn*, followed by LINE and the bridge line number where the address can be reached. Alternatively, you can enter DISPOSITION and the disposition of frames sent to the address. FILTER instructs the bridge to discard the frames, while FORWARD instructs the bridge to forward the frames. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password.

The following example adds an entry to the bridge NEWPORT's forwarding database for the physical address AA-00-04-21-41-24. The entry instructs the bridge to filter frames destined for that address.

```
ELMS> USE NEWPORT
ELMS> ADD ADDRESS AA-00-04-21-41-24 DISPOSITION FILTER
```

The next example adds an entry for the address AA-00-04-21-43-35 and instructs NEWPORT to forward frames sent to that address on line 1. (The default domain is still NEWPORT.)

```
ELMS> ADD ADDRESS AA-00-04-21-43-35 LINE 1
```

4.1.4.2 Adding a Multicast Address Entry

The ADD ADDRESS command adds a multicast or physical address entry to the forwarding database of a bridge. To add a multicast address entry, enter ADD ADDRESS followed by the multicast address to be filtered or forwarded in the form *nn-nn-nn-nn-nn-nn*. Next, enter DISPOSITION FILTER or DISPOSITION FORWARD to instruct the bridge to filter (discard) or forward frames with the address of the entry. If the target bridge is a LAN

Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password.

The following commands instruct the bridge CHARLESTOWN to discard all frames sent to the multicast address 09-00-03-21-44-35:

```
ELMS> USE CHARLESTOWN
ELMS> ADD ADDRESS 09-00-03-21-44-35 DISPOSITION FILTER PASSWORD BUNKERHILL
```

4.1.5 Removing Forwarding Entries

The REMOVE ADDRESS command deletes a physical or multicast address entry from the forwarding database of a bridge. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password. The following commands remove two entries from bridge RIPVANWINKLE's forwarding database: one for a physical address and one for a multicast address.

```
ELMS> USE RIPVANWINKLE
ELMS> REMOVE ADDRESS AA-00-04-21-43-35 PASSWORD FORTYWINKS
ELMS> REMOVE ADDRESS 09-00-03-21-44-35 PASSWORD FORTYWINKS
```

4.1.6 Modifying Forwarding Entries

This section explains how to use the SET ADDRESS command to modify a physical or multicast management address entry.

4.1.6.1 Modifying Physical Address Entries

The SET ADDRESS command modifies a physical or multicast managment address entry in the forwarding database of a bridge. (You can modify only entries that were added by the DECelms command ADD ADDRESS, not those that were added by the bridge's learning process.) For physical address entries, you can change the line on which the bridge will forward frames sent to the address or set the disposition of the entry.

The format and usage of the SET ADDRESS command are the same as those for ADD ADDRESS, except that the entry must already exist in the forwarding database. DISPOSITION FORWARD restores normal forwarding for a physical address that was previously set to DISPOSITION FILTER. The LINE parameter instructs the bridge to forward frames sent to the address of the entry on the line you specify.

The following commands modify a physical address entry in the bridge BOURNE's forwarding database, restoring normal forwarding. The entry previously had the disposition FILTER.

```
ELMS> USE BOURNE
ELMS> SET ADDRESS AA-00-04-21-43-35 DISPOSITION FORWARD
      PASSWORD BUZZARDSBAY
```

4.1.6.2 Modifying Multicast Address Entries

The SET ADDRESS command changes the disposition of a multicast or physical management address entry in the forwarding database of a bridge. You can modify only entries that were added by the DECelms command ADD ADDRESS, not those that were added by the bridge.

The format and usage of the SET ADDRESS command are the same as those for ADD ADDRESS, except that the entry must already exist in the forwarding database. DISPOSITION FORWARD restores normal forwarding for a multicast address that was previously set to DISPOSITION FILTER.

The following commands modify a multicast address entry in the bridge BOURNE's forwarding database, restoring normal forwarding. The entry previously had the disposition FILTER.

```
ELMS> USE BOURNE
ELMS> SET ADDRESS 09-00-03-21-43-35 DISPOSITION FORWARD
      PASSWORD BUZZARDSBAY
```

4.2 Managing LAN Bridge 200 and DECbridge 500 Address Filtering

The concepts and procedures described in Section 4.1, Managing Address Filtering, apply to all Digital bridges. This section describes the additional address filtering and forwarding functions of the LAN Bridge 200 and the DECbridge 500:

- Source address filtering
- Single command that clears out all management address entries

This chapter also describes a function that is available only on the LAN Bridge 200:

- Selective address forwarding

4.2.1 Source Address Filtering

On the LAN Bridge 200 and the Ethernet/IEEE 802.3 line of a DECbridge 500, management entries (entries added to the forwarding database with DECelms) instruct the bridge to check both source and destination addresses of frames. If the bridge sees the address of the entry in either the source or destination address field of a frame, it will forward or filter the frame, depending on the disposition of the management entry. However, when using an entry made by the bridge's learning process (a learned entry) to make filtering decisions, the LAN Bridge 200 and DECbridge 500 check only the destination address of frames. The LAN Bridge 100 and LAN Bridge 150 models check only the destination address of a frame, regardless of the type of forwarding entry.

NOTE

> The DECbridge 500 only performs source address filtering on frames received on its Ethernet/IEEE 802.3 line, not on frames received on its FDDI line.

The implication of source address filtering is that you can use management entries on a LAN Bridge 200 or a DECbridge 500 to block access **to and from** a station, whereas with the other bridge models management entries only block access **to** a station.

4.2.2 Cleaning Out the Management Entries

The REMOVE KNOWN ADDRESSES command removes all the management address entries from the forwarding database of a LAN Bridge 200 or a DECbridge 500. (Management entries are address entries that were added with the DECelms command ADD ADDRESS.) If the target bridge has a password set, you must include PASSWORD and the bridge's password. The following commands remove the management address entries from the forwarding database of the bridge CHAINBRIDGE:

```
ELMS> USE CHAINBRIDGE
ELMS> REMOVE KNOWN ADDRESSES PASSWORD NORTHSHORE
```

4.2.3 Selective Address Forwarding on a LAN Bridge 200

With a LAN Bridge 200, you can use DECelms to indicate the specific source and destination addresses to be forwarded and instruct the bridge to filter (discard) all other addresses. The SET MANUAL FILTER SWITCH command controls the setting of the Manual Filter switch, a software switch that controls the operation of the forwarding database. This command allows you to implement **selective address forwarding**. When the Manual Filter software switch is set to True, the bridge:

- Purges all learned entries from its forwarding database
- Stops its learning process
- Forwards only frames with source **and** destination addresses that have management entries set to FORWARD

The effect of selective address forwarding is that you have complete control of which stations can communicate across the bridge. Thus, it is suitable for a highly controlled, tight-security extended LAN. It is best to use selective address forwarding when you want to block general access and allow only a few stations to communicate across a bridge.

For example, you could implement selective address forwarding to control access to the segment containing the corporate payroll cluster. On the bridge connecting the segment to the rest of the extended LAN, you would first set the Manual Filter software switch to True. Then you would add entries with the disposition FORWARD for the stations allowed to access the corporate payroll segment and for the stations on the corporate payroll segment. Section 4.2.5 shows the commands to implement the selective address forwarding described in this example.

4.2.3.1 Exclusive Address Filtering

When the Manual Filter software switch is set to its default setting, False, bridge filtering works as described in Section 4.1, Managing Address Filtering. The effect is **exclusive address filtering**, where the bridge:

- Learns from the source addresses of frames and adds learned entries to its forwarding database
- Filters only frames with addresses that have a management entry set to FILTER

Thus, exclusive address filtering is the opposite of selective address forwarding. The bridge forwards frames unless it is explicitly told not to by a management entry with the disposition FILTER. It is best to use exclusive address filtering if you want to allow general access to a bridge but prevent a few stations from sending messages across. Exclusive address filtering is suitable for open-access extended LANs where filtering is used to prevent problem stations from squandering network resources.

Section 4.2.6 shows the commands to implement exclusive address filtering on a bridge. Address entries with the disposition FILTER prevent certain problem stations from sending or receiving frames across the bridge, while access is open to all other stations.

4.2.4 Precedence Over Protocol Filtering

The LAN Bridge 200 applies its address and protocol filters in a set order. The frame must successfully pass through all the filters if it is to cross the bridge. Figure 4–4 in Section 4.3.3 illustrates this decision flow. When the bridge receives a frame, it first checks the source and destination addresses. If the Manual Filter software switch is set to True for the bridge, the bridge discards the frame unless there are management entries with the disposition FORWARD for the frame's source **and** destination address. Conversely, if the Manual Filter software switch is set to its default setting, False, the bridge discards the frame only if there is a management entry with the disposition FILTER for the frame's destination or source address. (Figure 4–4 illustrates the filtering process when the Manual Filter software switch is set to False.)

If the frame successfully passes through the address filters, the bridge then applies its set of protocol filters, as described in Section 4.3.3, The Filtering Decision Flow. The frame must pass through all address and protocol filters if it is to be forwarded.

4.2.5 Implementing Selective Address Forwarding

To implement selective address forwarding on a LAN Bridge 200, first enter SET MANUAL FILTER SWITCH TRUE. Then, use the ADD ADDRESS command to add entries with the disposition FORWARD for the addresses of the stations allowed to send or receive traffic across the bridge. Section 4.1.4.1 and Section 4.1.4.2 describe how to add forwarding entries. If the target bridge has a password set, you must include PASSWORD for all of these commands, along with the bridge's password.

The following commands implement selective address forwarding on the LAN Bridge 200 named OLDNORTH:

```
ELMS> USE OLDNORTH
ELMS> SET MANUAL FILTER SWITCH TRUE PASSWORD MINUTEMAN
ELMS> ADD ADDRESS AA-00-04-00-21-63 DISPOSITION FORWARD
      PASSWORD MINUTEMAN
ELMS> ADD ADDRESS AA-00-04-03-25-65 DISPOSITION FORWARD
      PASSWORD MINUTEMAN
ELMS> ADD ADDRESS AA-00-04-02-41-33 DISPOSITION FORWARD
      PASSWORD MINUTEMAN
```

4.2.6 Implementing Exclusive Address Filtering

To implement exclusive address filtering on a LAN Bridge 200, first ensure that the Manual Filter software switch is set to False. (The SHOW CHARACTERISTICS command displays the current setting, as described in Section 4.2.7.) If the Manual Filter switch is set to True, enter SET MANUAL FILTER SWITCH FALSE. Then, use the ADD ADDRESS command to add entries with the disposition FILTER for the addresses of the stations to be blocked from sending or receiving traffic across the bridge. Section 4.1.4.1 and Section 4.1.4.2 describe how to add forwarding entries. If the target bridge has a password set, you must include PASSWORD for all of these commands, along with the bridge's password.

The following commands implement exclusive address filtering on the LAN Bridge 200 named QUEENSBORO:

```
ELMS> USE QUEENSBORO
ELMS> SET MANUAL FILTER SWITCH FALSE PASSWORD LONGISLAND
ELMS> ADD ADDRESS AA-00-04-00-37-43 DISPOSITION FILTER
      PASSWORD LONGISLAND
ELMS> ADD ADDRESS AA-00-04-03-29-60 DISPOSITION FILTER
      PASSWORD LONGISLAND
ELMS> ADD ADDRESS AA-00-04-02-43-21 DISPOSITION FILTER
      PASSWORD LONGISLAND
```

4.2.7 Checking the Setting of the Manual Filter Switch

To check the setting of the Manual Filter software switch on a LAN Bridge 200, enter SHOW CHARACTERISTICS with the target bridge as the command domain. The command in the following example shows the characteristics of the bridge TRIBOROUGH. The last field in the display, Manual Filter Switch, shows that the bridge HARVARD's switch is set to the default setting, False.

```
ELMS> SHOW BRIDGE TRIBOROUGH CHARACTERISTICS
Show Device Characteristics                          As of: 27-APR-1989 11:19:12
Name: TRIBOROUGH                                     Address: 08-00-2B-0C-1A-A7

Node ID (root priority/address):                     128/08-00-2B-0C-1A-A7
Software Implementation Type:                        DEBAM
Software Version:                                    1.2
ROM Implementation Type:                             DEBAM
ROM Version:                                         1.2
Hardware Version Number:                             1.0
LAN Bridge 100 Spanning Tree Version:                2
802 Spanning Tree Version:                           0
Max Forwarding Database Entries:                     15871
Max Nonvolatile Forwarding Database Entries:         400
Max Protocol Database Entries:                       64547
Nonvolatile Protocol Database Entries:               300
Forwarding Database Purge Threshold:                 15614
Port Count:                                          2
Downline Load Switch:                                Disabled
Downline Load File Name:
Downline Load Physical Switch:                       Disabled
Last Load Host:                                      AA-00-04-00-32-A3
Upline Dump Switch:                                  Enabled
Preferred Dump Host:                                 AA-00-04-00-32-A3
Last Dump Host:                                      AA-00-04-00-32-A3
Bridge Only Switch:                                  Enabled
Reset Defaults Switch:                               Disabled
Port Test Passed Threshold:                          10
Port Test Interval:                                  60
Topology Change Timer:                               0
Manual Filter Switch:                                False
Update Switch:                                       N/A
Fragmentation Switch:                                N/A
```

4.3 Managing Protocol Filtering

The LAN Bridge 200 and DECbridge 500 can filter frames based on their protocol type. These bridges can perform protocol filtering on Ethernet frames, IEEE 802.3 frames, and IEEE 802.2 SNAP frames. This section describes how the bridge performs protocol filtering and then explains how to manage the bridge protocol database. Appendix C contains a list of protocol values.

4.3.1 The Protocol Database

Just as the forwarding database and its address entries control the disposition of frames based on their address fields, the **protocol database** and its **protocol entries** control the disposition of frames based on their protocol identification fields. Each protocol entry identifies a protocol and instructs the bridge to forward or filter (discard) frames using the protocol.

You must add protocol entries to the protocol database of a bridge with the DECelms command ADD PROTOCOL. The bridge has no learning process to add entries automatically as it does with address entries. Thus, all protocol entries are **management protocol entries**. The bridge stores the first 256 protocol entries in both NVRAM and volatile memory. These **permanent protocol entries** are retained even in the event of a power-down or reset. The bridge stores subsequent protocol entries only in volatile memory; they are lost if the bridge loses power.

4.3.2 Types of Protocol Entries

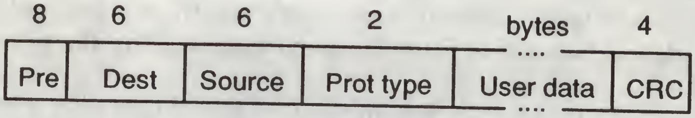
There are three types of protocol entries that correspond to the three types of frames that the bridge filters: Ethernet Protocol Type entries, IEEE 802.2 LSAP protocol entries, and IEEE 802.2 SNAP Protocol ID entries. Each type of protocol entry acts on the protocol identifier field of its frame type. Section 4.3.2.1, Section 4.3.2.2, and Section 4.3.2.3 describe each type of entry.

4.3.2.1 Ethernet Protocol Type Entries

Ethernet Protocol Type entries control the disposition of Ethernet frames based on the value in the Protocol Type field of the frame (see Figure 4–1).

The Protocol Type field of the Ethernet frame contains a 2-byte value, in the form *nn-nn*, that identifies the communications protocol being used at the higher layers of the network model. These values are assigned by the Ethernet address administration. For example, an Ethernet frame might have 60-03 in its Protocol Type field, indicating that the higher-layer information contained in the frame conforms to the DECnet protocol. Likewise, it might have 08-00 in the Protocol Type field, signaling to the higher layers that it contains TCP/IP protocol messages. Section C.1 contains a list of Ethernet Protocol Type values.

Figure 4–1: Ethernet Frame Format



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An Ethernet Protocol Type entry identifies a protocol value and instructs the bridge to forward or filter Ethernet frames that have the value in their Protocol Type field. The following example shows a set of Ethernet Protocol Type entries as they appear in the display of the DECelms command SHOW PROTOCOLS (described in Section 4.3.8).

Protocol-ID	Kind	Disposition
60-02	Ethernet Type	FILTER
60-01	Ethernet Type	FILTER
60-04	Etherent Type	FORWARD

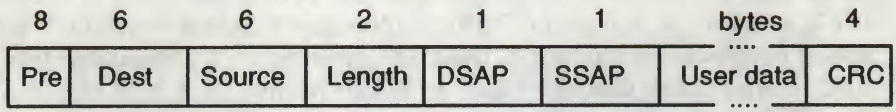
Entries such as the preceding ones that identify a specific protocol are called **explicit protocol entries**. Another entry, OTHER TYPES, is always present in the protocol database and is set to FORWARD by default. The OTHER TYPES entry controls the disposition of frames with Ethernet Protocol Types for which there are no explicit entries in the protocol database.

4.3.2.2 IEEE 802.2 LSAP Protocol Entries

IEEE 802.2 LSAP protocol entries control the disposition of standard (non-SNAP) IEEE 802.3 frames based on the values in the DSAP and SSAP fields, as shown in Figure 4–2.

The DSAP (Destination Service Access Point) and SSAP (Source Service Access Point) fields contain a 1-byte value in the form *nn* that identifies the higher-layer protocol contained in the frame. The LSAP (DSAP and SSAP)

Figure 4–2: IEEE 802.3 Frame Containing IEEE 802.2 Protocol Information



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values are assigned by the IEEE; each one identifies a particular protocol defined by a national or international standard. For example, an IEEE 802.3 frame with FE in its SSAP and DSAP fields contains higher-layer information that conforms to the ISO Connectionless-Mode Network Protocol (ISO 8473). Section C.2 contains a list of IEEE 802.2 LSAP protocol values.

An IEEE 802.2 LSAP protocol entry identifies a protocol value and instructs the bridge to forward or filter IEEE 802.3 frames that have the value in their SSAP and DSAP fields. The following example shows a set of IEEE 802.2 LSAP protocol entries as they appear in the display of the DECelms command SHOW PROTOCOLS (described in Section 4.3.8).

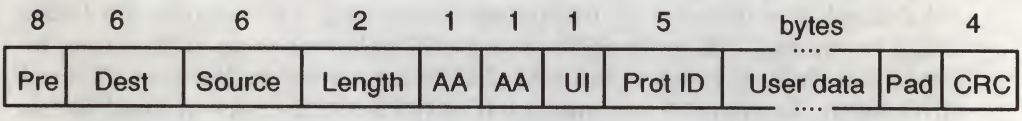
```
Protocol-ID         Kind                 Disposition

FE                  IEEE 802.2 LSAP      FILTER
AB                  IEEE 802.2 LSAP      FILTER
BA                  IEEE 802.2 LSAP      FORWARD
```

Entries such as the preceding ones that identify a specific protocol are called explicit protocol entries. Another entry, OTHER SAPS, is always present in the protocol database and is set to FORWARD by default. The OTHER SAPS entry controls the disposition of IEEE 802.3 frames with IEEE 802.2 LSAP protocol codes for which there are no explicit entries in the protocol database.

4.3.2.3 IEEE 802.2 SNAP Protocol ID Entries

The protocol values assigned by the IEEE and contained in the DSAP and SSAP fields of IEEE 802.3 frames identify only standard protocols. For protocols that are not national or international standards, there is another IEEE frame type, called the SNAP (Subnetwork Access Protocol) frame. SNAP frames are a variant of the UI (Unnumbered Information) frame of LLC (Logical Link Control) Class 1. SNAP frames have both the SSAP and the DSAP fields set to AA.

Figure 4–3: IEEE 802.2 SNAP Frame Format



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In an IEEE 802.2 SNAP frame, the first 5 bytes after the control field form the Protocol ID field. The Protocol ID field contains a value that identifies the higher-layer protocol contained in the frame. The Protocol ID value is 5 bytes in the form *nn-nn-nn-nn-nn*. The first 3 bytes are taken from the 24-bit organization unique identifier assigned by the IEEE; the last 2 bytes are assigned by the owner of the organization unique identifier. For example, an IEEE 802.2 SNAP frame with the value 08-00-2B-80-3C in its Protocol-ID field contains a Digital Network Architecture (DNA) Naming Service protocol message. (08-00-2B is the organization unique identifier for Digital.) Section C.3 contains a list of the IEEE 802.2 SNAP Protocol IDs used by Digital; refer to the vendor's documentation for SNAP Protocol IDs used by other companies.

An IEEE 802.2 SNAP Protocol-ID entry identifies a protocol value and instructs the bridge to forward or filter IEEE 802.2 SNAP frames that have the value in their Protocol ID fields. The following example shows a set of IEEE 802.2 SNAP Protocol-ID entries as they appear in the display of the DECelms command SHOW PROTOCOLS (described in Section 4.3.8).

Protocol-ID	Kind	Disposition
08-00-2B-60-04	IEEE 802.2 SNAP SAP	FILTER
08-00-2B-80-3C	IEEE 802.2 SNAP SAP	FILTER
08-00-2B-80-3B	IEEE 802.2 SNAP SAP	FORWARD

Entries such as the preceding ones that identify a specific protocol are called explicit protocol entries. Another entry, OTHER SNAPS, is always present in the protocol database and is set to FORWARD by default. The OTHER SNAPS entry controls the disposition of IEEE 802.2 SNAP frames with IEEE 802.2 SNAP Protocol IDs for which there are no explicit entries in the protocol database.

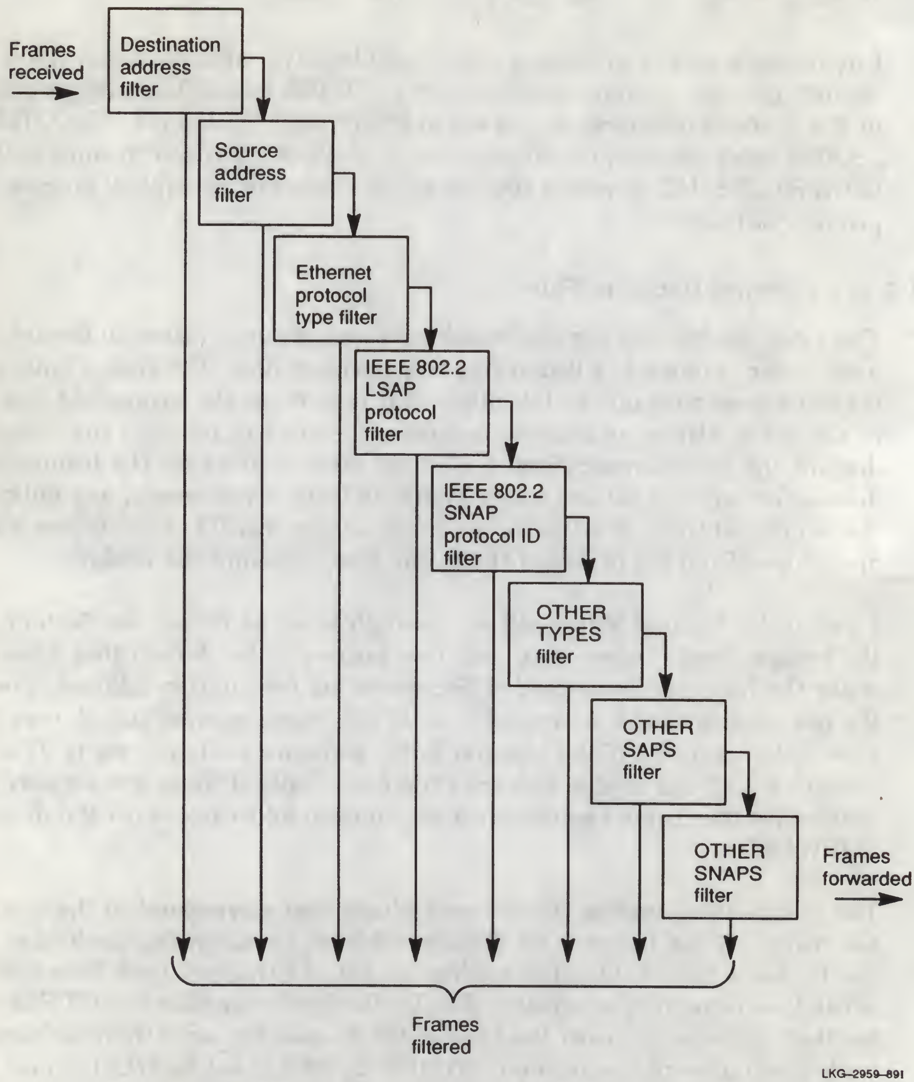
4.3.3 The Filtering Decision Flow

The LAN Bridge 200 applies its address and protocol filters to frames in a set order. Figure 4–4 illustrates this decision flow. The frame must successfully pass through all the filters if it is to cross the bridge. At any stage in the set of filters, an address or protocol entry can instruct the bridge to discard the frame, regardless of whether other entries for the frame's addresses or protocol ID are set to FORWARD. In other words, any entry for the source address, destination address, or protocol ID of the frame with the disposition FILTER prevents the frame from crossing the bridge.

First, if the Manual Filter software switch is set to False (see Section 4.2.3.1), the bridge checks to see if any address entries in the forwarding database order the frame to be discarded because of its destination address. Next, the bridge checks the source address of the frame against its address entries. Alternatively, if the Manual Filter software switch is set to True (see Section 4.2.3), the bridge forwards the frame only if there are forwarding entries for the frame's source **and** destination addresses with the disposition FORWARD.

The bridge then applies the protocol filters that correspond to the type of the frame. If the frame is an Ethernet frame, for example, the bridge checks the Protocol Type field value against its set of Ethernet Type filters, and discards the frame if appropriate. Finally the bridge applies the OTHER filter that corresponds with the type of the frame. For an Ethernet frame, the bridge will discard the frame if OTHER TYPES is set to FILTER and there is no explicit entry with the disposition FORWARD for the protocol type of the frame.

Figure 4–4: The Filtering Decision Flow



4.3.4 Planning Protocol Filtering

Before you implement protocol filtering on a bridge, it is wise to make a list of the Ethernet, IEEE 802.2 LSAP, and IEEE 802.2 SNAP protocols that you want to filter or forward. Then, depending on the size of the list for each category, you must decide whether to implement exclusive protocol filtering or selective protocol forwarding for the category. Section 4.3.4.1 and Section 4.3.4.2 describe exclusive protocol filtering and selective protocol forwarding.

4.3.4.1 Exclusive Protocol Filtering

The more common approach to protocol filtering is **exclusive protocol filtering**, where explicit entries set to FILTER identify the protocols to be excluded while the OTHER entry is set to FORWARD. Exclusive protocol filtering allows general access while blocking out specific protocols. It is best to use exclusive protocol filtering for a category (such as Ethernet Protocol Types) if you want to filter out a few protocols and allow all the other protocols to cross the bridge.

For example, you might want to prevent Ethernet frames containing the TCP/IP protocol from crossing the bridge, while maintaining access for all other protocols. You would add an Ethernet Type entry with the disposition FILTER for the TCP/IP protocol value, 08-00. Then, you would ensure that the OTHER TYPES, OTHER SAPS, and OTHER SNAPS entries were set to FORWARD. Section 4.3.5.1 shows the commands to implement the exclusive protocol filtering described in this example.

4.3.4.2 Selective Protocol Forwarding

Selective protocol forwarding is the opposite of exclusive protocol filtering; explicit entries set to FORWARD identify the sanctioned protocols while the OTHER entry is set to FILTER. Selective protocol forwarding blocks general access and allows only specified protocols to cross the bridge. It is best to use selective protocol forwarding for a category of protocols if you want to allow only a few protocols to cross the bridge. Selective protocol forwarding is thus preferable for a highly controlled, tight-security network.

For example, you might want to allow only DECnet and LAT frames to cross a bridge. You would add Ethernet Type entries with the disposition FORWARD for the values of those protocols, 60-03 and 60-04. Then you would ensure that the OTHER TYPES, OTHER SAPS, and OTHER SNAPS entries were set to FILTER. Section 4.3.5.2 shows the commands to implement the selective protocol forwarding described in this example.

4.3.5 Adding Protocol Entries

After you plan the protocol filtering for a bridge, use the ADD PROTOCOL and SET PROTOCOL commands to implement the filtering. DECelms places the first 256 protocol entries in both volatile memory (RAM) and non-volatile memory (NVRAM) so that they are retained even if the bridge is powered down or initialized. (The bridge places subsequent protocol entries only in RAM; these entries are lost if the bridge loses power.)

The ADD PROTOCOL command adds protocol entries to the protocol database of a bridge. You must give the protocol value for the entry in the form *nn-nn* for Ethernet Protocol Type entries, *nn* for IEEE 802.2 LSAP protocol entries, or *nn-nn-nn-nn-nn* for IEEE 802.2 SNAP Protocol ID entries. Table 4–2 summarizes the types of protocol entries and the corresponding values. Next, type DISPOSITION and FORWARD or FILTER. FORWARD instructs the bridge to forward frames with the specified protocol. FILTER instructs the bridge to discard frames with the specified protocol, preventing frames of the specified protocol type from crossing the bridge. If the target bridge has a password set, you must include PASSWORD and the bridge's password.

Table 4–2: Protocol Kinds and Values

Protocol Kind	Value Format	Description
ETHERNET TYPE	*nn-nn* (2 hex bytes)	The Protocol Type field of Ethernet frames
802 SAP	*nn* (1 hex byte)	The IEEE 802.2 LSAP protocol value that appears in the DSAP and SSAP fields of IEEE 802.3 frames
802 SNAP	*nn-nn-nn-nn-nn* (5 hex bytes)	The Protocol ID field of IEEE 802.2 SNAP frames

Section 4.3.5.1 and Section 4.3.5.2 explain how to implement exclusive protocol filtering and selective protocol forwarding.

4.3.5.1 Implementing Exclusive Protocol Filtering

To implement exclusive protocol filtering on a bridge, make explicit entries with the disposition FILTER for the protocols to be blocked and ensure that the OTHER TYPES, OTHER SAPS, and OTHER SNAPS entries are set to their default disposition, FORWARD. If the OTHER entries were previously changed to FILTER, use the SET PROTOCOL command to set them back to FORWARD. (Section 4.3.7 describes the SET PROTOCOL command.) If necessary, you can implement exclusive protocol filtering or selective protocol forwarding on a category-by-category basis. For example, you could use selective protocol forwarding for Ethernet Protocol Types and exclusive protocol filtering for IEEE 802.2 LSAP protocols and IEEE 802.2 SNAP Protocol IDs.

The commands in the following example implement exclusive protocol filtering on the bridge MANHATTAN. The ADD PROTOCOL command adds an explicit entry instructing MANHATTAN to discard frames with the Ethernet Protocol Type DOD_TCPIP (value 08-00). The next three SET PROTOCOL commands instruct MANHATTAN to forward all other Ethernet, IEEE 802.2 LSAP, and IEEE 802.2 SNAP protocol types. (These commands would not be necessary if the OTHER entries had not been previously changed from their default value of FORWARD.)

```
ELMS> USE MANHATTAN
ELMS> ADD PROTOCOL 08-00 DISPOSITION FILTER PASSWORD SKYSCRAPER
ELMS> SET PROTOCOL OTHER TYPES DISPOSITION FORWARD PASSWORD SKYSCRAPER
ELMS> SET PROTOCOL OTHER SAPS DISPOSITION FORWARD PASSWORD SKYSCRAPER
ELMS> SET PROTOCOL OTHER SNAPS DISPOSITION FORWARD PASSWORD SKYSCRAPER
```

4.3.5.2 Implementing Selective Protocol Forwarding

To implement selective protocol forwarding on a bridge, make explicit entries with the disposition FORWARD for the protocols allowed to cross the bridge and set the OTHER TYPES, OTHER SAPS, and OTHER SNAPS entries to FILTER with the SET PROTOCOL command. Again, you can also implement selective protocol forwarding or exclusive protocol filtering on a category-by-category basis for each category of protocols, as described in Section 4.3.5.1.

The following commands implement selective protocol forwarding on the bridge HARVARD. The first two ADD PROTOCOL commands make explicit entries instructing HARVARD to forward frames with the Ethernet Protocol Types DEC_NET (value 60-03) and DEC_LAT (value 60-04). The next three SET PROTOCOL commands instruct HARVARD to discard all other Ethernet, IEEE 802.2 LSAP, and IEEE 802.2 SNAP protocols.

```
ELMS> USE HARVARD
ELMS> ADD PROTOCOL 60-03 DISPOSITION FORWARD PASSWORD CANTABRIDGIAN
ELMS> ADD PROTOCOL 60-04 DISPOSITION FORWARD PASSWORD CANTABRIDGIAN
ELMS> SET PROTOCOL OTHER TYPES DISPOSITION FILTER PASSWORD CANTABRIDGIAN
ELMS> SET PROTOCOL OTHER SAPS DISPOSITION FILTER PASSWORD CANTABRIDGIAN
ELMS> SET PROTOCOL OTHER SNAPS DISPOSITION FILTER PASSWORD CANTABRIDGIAN
```

4.3.6 Removing Protocol Entries

You can remove a specific protocol entry from the protocol database of a bridge (see Section 4.3.6.1) or clean out the entire protocol database (see Section 4.3.6.2).

4.3.6.1 Removing a Specific Protocol Entry

The REMOVE PROTOCOL command deletes a protocol entry from the protocol database of a bridge. Removing a protocol entry is similar to adding one, except that you do not specify the disposition when deleting an entry. (You must supply the value of the entry in the form shown in Table 4–2.) If the target bridge has a password set, you must include PASSWORD and the bridge's password. Note that you cannot delete the entries for OTHER TYPES, OTHER SAPS, and OTHER SNAPS. Instead, you must use the SET PROTOCOL command to set these entries to FILTER or FORWARD (the default), as described in Section 4.3.7.

The following commands remove the entry for the DEC_NET Ethernet Protocol Type (value 60-03) from the protocol database of the bridge BROOKLYN:

```
ELMS> USE BROOKLYN
ELMS> REMOVE PROTOCOL 60-03 PASSWORD APPLE
```

The following commands delete an IEEE 802.2 SNAP Protocol ID entry from the protocol database of the bridge JAMESRIVER. This entry is for the Protocol ID of the VAX Distributed Name Service (DNS), which has the value 08-00-2B-80-3C.

```
ELMS> USE JAMESRIVER
ELMS> REMOVE PROTOCOL 08-00-2B-80-3C PASSWORD POCAHONTAS
```

4.3.6.2 Cleaning Out the Entire Protocol Database

The REMOVE KNOWN PROTOCOLS command deletes all the entries from the protocol database of a bridge. If the target bridge has a password set, you must include PASSWORD and the bridge's password. The following commands clean out the protocol database of the bridge CHESAPEAKE:

```
ELMS> USE CHESAPEAKE
ELMS> REMOVE KNOWN PROTOCOLS PASSWORD OYSTERSHELL
```

4.3.7 Modifying Protocol Entries

The SET PROTOCOL command modifies existing entries in the protocol database of a bridge. You can modify protocol entries that were added by the DECelms command ADD PROTOCOL or change the dispositions of the three entries that are in the protocol database by default: OTHER TYPES, OTHER SAPS, and OTHER SNAPS.

4.3.7.1 Modifying Management Protocol Entries

When used to modify a management protocol entry (an entry added with DECelms), SET PROTOCOL has the same format as ADD PROTOCOL, which is described in Section 4.3.5. You must supply the value of the protocol entry to be modified in the form shown in Table 4–2. The DISPOSITION parameter allows you to change the way that the bridge will treat frames with the given protocol: FORWARD instructs the bridge to forward them normally, while FILTER instructs the bridge to discard them. If the target bridge has a password set, you must include PASSWORD and the bridge's password.

The following commands modify the protocol database of the bridge WALTWHITMAN, changing the disposition of frames with the DOD_TCPIP Ethernet Protocol Type (value 08-00). These commands instruct WALTWHITMAN to forward DOD_TCPIP frames instead of filtering them.

```
ELMS> USE WALTWHITMAN
ELMS> SET PROTOCOL 08-00 DISPOSITION FORWARD PASSWORD BROTHERLY
```

4.3.7.2 Modifying the Entries for OTHER TYPES, OTHER SAPS, or OTHER SNAPS

The SET PROTOCOL command also allows you to modify the disposition of the OTHER TYPES, OTHER SAPS, and OTHER SNAPS entries in the protocol database of a bridge. By default, these entries are set to FORWARD, causing the bridge to forward frames of all protocol types unless instructed not to by explicit protocol entries. Thus, the bridge uses exclusive protocol filtering by default. To implement selective protocol forwarding (as described in Section 4.3.5.2), you need to set the OTHER entries to FILTER, as shown in the following example:

```
ELMS> USE MANHATTAN
ELMS> SET PROTOCOL OTHER TYPES DISPOSITION FILTER PASSWORD SKYSCRAPER
ELMS> SET PROTOCOL OTHER SAPS DISPOSITION FILTER PASSWORD SKYSCRAPER
ELMS> SET PROTOCOL OTHER SNAPS DISPOSITION FILTER PASSWORD SKYSCRAPER
```

4.3.8 Displaying Protocol Entries

This section explains how to use the SHOW PROTOCOL and SHOW PROTOCOLS commands to display the entries stored in a bridge's protocol database. You can display specific entries, different categories of protocol entries, or the entire protocol database.

4.3.8.1 Displaying a Specific Protocol Entry

The SHOW PROTOCOL command displays the protocol entry for a specific protocol, showing whether the disposition is set to FORWARD or FILTER. SHOW PROTOCOL displays the protocol entries added by the ADD PROTOCOL command and the OTHER TYPES, OTHER SAPS, and OTHER SNAPS entries that are in the protocol database by default. You must supply the value of the protocol to be displayed in the form shown in Table 4–2. Include the optional TO *file-spec* phrase to send the output to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

The following commands display the entry in the bridge WILLIAMSBURG's protocol database for the IEEE 802.2 SNAP Protocol ID 08-00-2B-60-03:

```
ELMS> USE WILLIAMSBURG
ELMS> SHOW PROTOCOL 08-00-2B-60-03

Protocol Filter Forwarding Entry        As of: 27-APR-90 17:07:54
Name: WILLIAMSBURG                    Address: 08-00-2B-33-44-55
```

```
Protocol Kind:      IEEE 802.2 SNAP SAP
Protocol Value:     08-00-2B-60-03
Disposition:        FILTER
Volatility:         Volatile
```

The following command displays the setting of the OTHER TYPES entry in the protocol database of the bridge CHARLESTOWN:

```
ELMS> SHOW CHARLESTOWN PROTOCOL OTHER TYPES

MANAGEMENT Protocol Filter Forwarding Entries  As of: 27-APR-90 17:07:54
Name: CHARLESTOWN                            Address: 08-00-2B-33-AB-2A

Protocol-ID              Kind               Disposition
-------------------------------------------------------------
None                     Other Types        FORWARD
```

By making KNOWN BRIDGES the command domain, you can display the entry for a given protocol in the protocol database of every bridge listed in the DECelms registry. This gives you a global picture of how frames with the protocol type are treated throughout the extended LAN. For example:

```
ELMS> USE KNOWN BRIDGES
ELMS> SHOW PROTOCOL 08-00-2B-60-03 TO SNAP.DAT
```

4.3.8.2 Displaying Specific Types of Entries or Protocols

The SHOW PROTOCOLS command displays the protocol entries in the protocol database of a bridge. SHOW PROTOCOLS displays the protocol entries in each category (ETHERNET TYPE, 802 SAP, and 802 SNAP). You can display only one category at a time. For each kind of protocol entry, you can display all the entries in the protocol database (management entries), or only those that are stored in NVRAM (permanent entries). The SHOW PROTOCOLS command has the following format:

$$\text{SHOW} \begin{bmatrix} \text{MANAGEMENT} \\ \text{PERMANENT} \end{bmatrix} \text{PROTOCOLS}$$

$$\left\{ \begin{array}{l} \text{ETHERNET TYPES} \\ \text{802 SAPS} \\ \text{802 SNAPS} \end{array} \right\} [\text{TO } \textit{file-spec}]$$

You must specify the type of protocol entries to be displayed as described in Table 4–3 and the kind of protocol entries to be displayed as described in Table 4–4. Include the optional TO *file-spec* phrase to send the output to the specified file rather than to your screen. (You can specify the directory and file name, but not the node name or the device name.)

Table 4–3: Types of Protocol Database Entries

Protocol Entry Type	Description
MANAGEMENT	All the protocol database entries, including those saved permanently in NVRAM and those stored only in volatile memory (if any). DECelms places protocol entries in both NVRAM and volatile memory if there is enough room in NVRAM. If NVRAM is full, DECelms places new protocol entries only in volatile memory.
PERMANENT	Management entries that are stored in the bridge's non-volatile memory (NVRAM). If the bridge's NVRAM is full, this may be a subset of management entries.

Table 4–4: Kinds of Entries in the Protocol Database

Protocol Kind	Description
ETHERNET TYPES	Entries that identify Ethernet Protocol Types. These entries have 2-byte values in the form *nn-nn* that appear in the Protocol Type field of Ethernet frames.
802 SAPS	Entries that identify the protocol shown in the DSAP and SSAP fields of IEEE 802.3 frames. These protocols have 1-byte values in the form *nn*.
802 SNAPS	Entries that identify the protocol shown in the Protocol ID field of IEEE 802.2 SNAP frames. These protocols have 5-byte values in the form *nn-nn-nn-nn-nn*.

The following commands display all the Ethernet Protocol Type entries in the protocol database of the bridge HAMPTONROADS:

```
ELMS> USE HAMPTONROADS
ELMS> SHOW MANAGEMENT PROTOCOLS ETHERNET TYPES

MANAGEMENT Protocol Filter Forwarding Entries   As of: 27-APR-90 17:25:54
Device: HAMPTONROADS                           Address: 08-00-2B-32-14-55

Protocol-ID        Kind               Disposition

60-02              Ethernet Type      FILTER
60-01              Ethernet Type      FILTER
60-04              Ethernet Type      FORWARD
```

The resulting display lists the Ethernet Protocol Type values for which there are entries, along with the disposition of each entry. Filter instructs the bridge to discard Ethernet frames with the given Protocol Type, while Forward instructs the bridge to forward them normally.

The next example shows the commands to send all the management entries and all the permanent IEEE 802.2 LSAP protocol entries in bridge HAMPTONROADS's protocol database to separate files. Any management entries that do not appear in the file of permanent entries were entered only in volatile memory because there was not enough room in NVRAM. No domain is given because the USE command in the last example set the default command domain to be HAMPTONROADS.

```
ELMS> SHOW MANAGEMENT PROTOCOLS 802 SAPS TO HAMPTONROADS.MNGMT
ELMS> SHOW PERMANENT PROTOCOLS 802 SAPS TO HAMPTONROADS.PERM
```

By making KNOWN BRIDGES the command domain, you can show the protocol entries of a given type stored in the protocol databases of all the bridges listed in the DECelms registry. The following commands display the Ethernet Protocol Type entries that were added to the bridge protocol databases throughout the extended LAN.

```
ELMS> USE KNOWN BRIDGES
ELMS> SHOW MANAGEMENT PROTOCOLS ETHERNET TYPES
```

5 Monitoring Devices

This chapter explains how to use DECelms (DEC Extended LAN Management Software) to monitor bridges and wiring concentrators and their lines and physical ports. It describes the following monitoring tasks:

- Checking Status
- Displaying Characteristics
- Displaying Spanning Tree Parameter Values
- Displaying Counters
- Displaying SMT Information
- Using a LAN Bridge 200 as a LAN Monitor

5.1 Checking Status

This section explains how to use the SHOW STATUS command to display the status of a bridge or wiring concentrator. You can display the status of the device as a whole (see Section 5.1.1), the status of each line on the device (see Section 5.1.2), or the status of each physical port (see Section 5.1.3).

5.1.1 Checking Device Status

When a bridge or wiring concentrator is the command domain, the SHOW STATUS command displays the operational state of the device as a whole. For a description of the SHOW STATUS display for a device, see the following sections:

- Bridge—Section 5.1.1.1
- Wiring Concentrator—Section 5.1.1.2

NOTE

You cannot show the status of a bridge that is serving as a LAN Traffic Monitor (LTM) listener; in that case, SHOW CHARACTERISTICS is the only valid monitoring command.

The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.) The following commands display the status of the bridge BATTERSEA:

```
ELMS> USE BATTERSEA
ELMS> SHOW STATUS
```

The following commands display the status of the wiring concentrator GRANDCENTRAL:

```
ELMS> USE GRANDCENTRAL
ELMS> SHOW STATUS
```

By making KNOWN BRIDGES or KNOWN CONCENTRATORS the command domain, you can display the status of all the bridges or wiring concentrators listed in the DECelms registry that are able to respond to DECelms commands. The following command sends the status of all bridges listed in the DECelms registry to the file BRIDGE.STATUS:

```
ELMS> SHOW KNOWN BRIDGES STATUS TO BRIDGE.STATUS
```

When KNOWN DEVICES is the command domain, SHOW STATUS displays the status of all bridges and wiring concentrators listed in the DECelms registry that are able to respond to DECelms commands. The following commands display the status of all the active devices listed in the DECelms registry:

```
ELMS> USE KNOWN DEVICES
ELMS> SHOW STATUS
```

5.1.1.1 Bridge Status Display

This section describes the SHOW STATUS display for all models of bridges. Table 5–1 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target bridge. N/A appears in a display field if the field does not apply to the model of bridge being monitored. Depending on your terminal type, you may have to press the down arrow key (⇩) or the next screen key (Next Screen) to view the entire display. An example of the SHOW STATUS display for a LAN Bridge 200 follows.

```
Show Device Status                         As of: 27-APR-1990 11:19:12
Name: BATTERSEA                             Address: 08-00-2B-23-23-54

Device State:                                        OPERATE
Current Forwarding Database Entries:                 100
Current Nonvolatile Forwarding Database Entries:     10
Current Protocol Database Entries:                   10
Current Nonvolatile Protocol Database Entries:       10
Management Request Heard Port:                       2
LAN Bridge 100 Being Polled:                         08-00-2B-04-34-9B
Spanning Tree Mode:                                  LAN Bridge 100
Inactive Forwarding Database Entries:                31
Time Since Forwarding Database Purged:               27
Device Broken Reason:
NVRAM Failed Flag:                                   False
Time Since Last Hello Sent:                          0
Device Configuration:

   FRU Type         FRU State       FRU Id      FRU Revision
   --------         ---------       ------      ------------
   AP Card          Working          N/A        Revision 1.0
   FI Card          Working          N/A        Revision 1.0
   NI Card          Working          N/A        Revision 1.0
   QM Card          Working          N/A        Revision 1.0
```

Table 5–1: Bridge Status Display Fields

Display Field	Description
Device State	The operational state of the bridge: INIT — The bridge is performing the initialization and self-test sequence. BROKEN — The bridge has detected an internal hardware error that cannot be remedied by the software. OPERATE — The bridge is in the normal operational state.
Current Forwarding Database Entries	The number of address entries in the bridge's volatile memory. All of these entries will be lost if the bridge loses power.
Current Nonvolatile Forwarding Database Entries	The number of address entries in the bridge's nonvolatile memory (NVRAM). These entries are retained even if the bridge loses power, because the bridge reloads them into volatile memory when it is powered up again.
Current Protocol Database Entries	The number of entries in the bridge's protocol database. These entries control the disposition of frames based on their Ethernet Protocol Type, IEEE 802.2 LSAP protocol value, or IEEE 802.2 SNAP Protocol ID. This number includes the permanent protocol entries that are stored in both volatile and nonvolatile memory, as well as those that are stored only in volatile memory. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Current Nonvolatile Protocol Database Entries	The number of protocol entries that are stored in both nonvolatile and volatile memory. These permanent entries are retained even if a power-down or reset occurs. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Management Request Heard Port	The line number on which the bridge received the SHOW STATUS command that caused this display.
LAN Bridge 100 Being Polled	The address of the LAN Bridge 100 Spanning Tree Mode-only bridge that this bridge is currently polling. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models. The root bridge periodically polls to see if a bridge that can run only in the LAN Bridge 100 Spanning Tree Mode is still present in the network.

Table 5–1 (Cont.): Bridge Status Display Fields

Display Field	Description
Spanning Tree Mode	The spanning tree mode being used by the bridge. LAN Bridge 100 is the LAN Bridge 100 Spanning Tree Mode defined by the Digital Network Architecture; 802 is the 802 Spanning Tree Mode defined by IEEE 802.1. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Inactive Forwarding Database Entries	The number of inactive address entries in the bridge's forwarding database. The bridge marks an address entry inactive if it does not use the entry for forwarding or see its address in the source address of a frame during the aging time set for the bridge's forwarding database. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Time Since Forwarding Database Purged	The number of seconds since the bridge cleared the inactive entries from its forwarding database. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Device Broken Reason	The reason that the Device State (the first field in the Bridge Status display) is BROKEN. If the Device State is not BROKEN and the Unsolicited Resets counter (described in Table 5–14) is nonzero, this field shows the reason for the last device failure. Self-test failure — The bridge failed one of its self-tests during initialization. On-line diagnostic failure — The bridge failed one of the background diagnostic tests that it performs during normal operation. Operational firmware failure — The bridge's firmware encountered a fatal error.
NVRAM Failed Flag	The setting of a flag that, when set to True, indicates that the nonvolatile memory (NVRAM) failed its self-test following the last power-up or initialization of the bridge.
Time Since Last Hello Sent	The time, in seconds, since the bridge last sent a Hello message. This field applies only when the bridge is serving as the root bridge.

Table 5–1 (Cont.): Bridge Status Display Fields

Display Field	Description
Device Configuration	The configuration and operational status of the field replaceable units (FRUs) in the bridge. This field contains the following subfields: FRU Type: a description of the FRU. — AP Card—AP (application) logic module board — FI Card—FI (FDDI interface) logic module board — NI Card—NI (Network Interconnect, now known as Ethernet/IEEE 802.3) logic module board — QM Card—Queue Manager board, which services frames received on the FDDI line FRU State: the operational state of the component. — Empty — There is no board in the slot — Working — The component is working normally — Marginal — The component is working, but should be serviced immediately — Broken — The component is nonoperational and must be replaced immediately Contact your Digital Customer Service representative if any of the FRUs are Marginal or Broken. FRU Id: for wiring concentrator printed circuit boards, this field shows the slot location on the backplane. DECelms displays N/A in this field for other components. FRU Revision: the hardware revision level of the component. This field applies only to the DECbridge 500.

5.1.1.2 Wiring Concentrator Status Display

This section describes the SHOW STATUS display for a wiring concentrator. Table 5–2 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target wiring concentrator. An example of the SHOW STATUS display for a wiring concentrator follows.

```
Show Device Status                      As of: 27-APR-1990 11:19:12
Name: GRANDCENTRAL                        Address: 08-00-2B-0C-1A-A7

Device State:                                                OPERATE
Device Broken Reason:
NVRAM Failed Flag:                                            False
Device Configuration:

   FRU Type             FRU State      FRU Id     FRU Revision
   --------             ---------      ------     ------------
   Motherboard          Working        N/A        Revision 1.0
   Management Card      Working        Slot 1     Revision 1.0
   4 Line ANSI Port     Working        Slot 2     Revision 1.0
   4 Line ANSI Port     Working        Slot 3     Revision 1.0
```

Table 5–2: Wiring Concentrator Status Display Fields

Display Field	Description
Device State	The operational state of the wiring concentrator: INIT — The wiring concentrator is performing its initialization and self-test sequence. BROKEN — The wiring concentrator has detected an internal hardware error that cannot be remedied by the software. OPERATE — The wiring concentrator is in the normal operational state.

Table 5–2 (Cont.): Wiring Concentrator Status Display Fields

Display Field	Description
Device Broken Reason	The reason that the Device State (the first field in the Wiring Concentrator Status display) is BROKEN. If the Device State is not BROKEN and the Unsolicited Resets counter (described in Section 5.4.1.2) is nonzero, this field shows the reason for the last failure. Self-test failure — The wiring concentrator failed one of its self-tests during initialization. On-line Diagnostic failure — The wiring concentrator failed one of the background diagnostic tests that it performs during normal operation. Operational firmware failure — The wiring concentrator's firmware encountered a fatal error.
NVRAM Failed Flag	The setting of a flag that, when set to True, indicates that the nonvolatile memory (NVRAM) failed its self-test following the last power-up or initialization of the wiring concentrator.
Device Configuration	The configuration and operational status of the field replaceable units (FRUs) in the wiring concentrator. This field contains the following subfields: FRU Type: a description of the FRU. — Motherboard — Controller/backplane board. — Management Card — Network management board. — 4 Line ANSI Port — A physical port board.

Table 5–2 (Cont.): Wiring Concentrator Status Display Fields

Display Field	Description
	FRU State: the operational state of the component, as described below. — Empty — There is no board in the slot. — Working — The component is working normally. — Marginal — The component is working, but should be serviced immediately. — Broken — The component is nonoperational and must be replaced immediately. Contact your Digital Customer Service representative if any of the FRUs are Marginal or Broken. FRU Id: for certain printed circuit boards, this field shows the slot location on the backplane. DECelms displays N/A in this field for other components. FRU Revision: the hardware revision level of the component.

5.1.2 Checking Line Status

When a bridge or wiring concentrator line is the command domain, the SHOW STATUS command displays the operational state of the line. For a description of the SHOW STATUS display for a line, see the following sections:

- Bridge Ethernet/IEEE 802.3 line—Section 5.1.2.1
- Bridge or Wiring Concentrator FDDI line—Section 5.1.2.2

The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

To display the status of a specific line, enter LINE and the line number. The following commands display the status of line 2 on the bridge VAUXHALL:

```
ELMS> USE VAUXHALL LINE 2
ELMS> SHOW STATUS
```

DECconcentrator 500 models have only one line, line 1. The following command displays the status of the line on the wiring concentrator SOUTHSTATION:

```
ELMS> SHOW SOUTHSTATION LINE 1 STATUS
```

To display the status of both lines on a bridge, make KNOWN LINES the command domain. The following commands send the status of both lines on the bridge VAUXHALL to the file VAUXHALL.STATUS:

```
ELMS> USE VAUXHALL KNOWN LINES
ELMS> SHOW STATUS TO VAUXHALL.STATUS
```

5.1.2.1 Bridge Ethernet/IEEE 802.3 Line Status Display

This section describes the SHOW STATUS display for an Ethernet/IEEE 802.3 line on a LAN Bridge 150, LAN Bridge 200, or DECbridge 500. You cannot display the status of a LAN Bridge 100 line. Table 5–3 describes the fields of this display. The display header shows the current date and time, along with the name and address of the bridge that contains the line being monitored. N/A appears in a display field if the field does not apply to the model of bridge being monitored. An example of the SHOW STATUS display for a LAN Bridge 200 Ethernet/IEEE 802.3 line follows.

```
Line Status for Line 1         As of: 27-APR-1990 11:22:06
Name: VAUXHALL                  Address: 08-00-2B-0C-1A-A7

Local Network Module Broken Reason: Port Not Broken
```

Table 5–3: Bridge Ethernet/IEEE 802.3 Line Status Display Fields

Display Field	Description
Local Network Module Broken Reason	The reason that the Local Network Module State (shown in the Line Spanning Characteristics display) is BROKEN. If the Local Network Module State is not BROKEN and the Port Restarts counter (described in Table 5–16) is nonzero, this field shows the reason for the last line failure, if any. This field applies only to the LAN Bridge 200 and the DECbridge 500. Possible internal fault — A problem with the bridge line itself. Possible external fault — A problem with the transmission medium to which this line is attached.

5.1.2.2 Bridge or Wiring Concentrator FDDI Line Status Display

This section describes the SHOW STATUS display for an FDDI line on a DECbridge 500 or a DECconcentrator 500. (On the DECbridge 500, the FDDI line is always line 1. DECconcentrator 500 models have only one line, line 1.) This display shows the operational state of the FDDI MAC entity of the device. Table 5–4 describes the fields of this display. The display header shows the current date and time, along with the name and address of the device that contains the line being monitored. An example of the SHOW STATUS display for a DECbridge 500 FDDI line follows.

```
Line Status for Line 1          As of: 27-APR-1990 11:22:06
Name: JAMESRIVER                 Address: 08-00-2B-0C-1A-A7

Local Network Module Broken Reason:
Link State:                          On Ring Running
Duplicate Address Condition:         Absent
Ring Purger State:                   Purger
Claim Token Yield:                   False
Target TRT:                          8.0 ms
Upstream Neighbor Address:           08-00-2B-FC-00-23
UNA Timed Out:                       False
Ring Error Reason:
```

Table 5–4: FDDI Line Status Display Fields

Display Field	Description
Local Network Module Broken Reason	The reason that the Local Network Module State (shown in the Line Spanning Characteristics display) is BROKEN. If the Local Network Module State is not BROKEN and the Port Restarts counter (described in Table 5–16) is nonzero, this field shows the reason for the last line failure, if any. Possible internal fault — A problem with the bridge line itself. Possible external fault — A problem with the transmission medium to which this line is attached. This field is not displayed for wiring concentrator lines.
Link State	The operational state of the FDDI MAC entity of the station: Off Ring Initializing — The FDDI MAC entity is initializing and conducting its self-test sequence. Off Ready — The FDDI MAC entity is ready for operation but not yet connected to the logical ring. On Ring Initializing — The FDDI MAC entity is attempting to connect to the logical ring. On Ring Running — The FDDI MAC entity is connected to the logical ring and fully operational. Off Fault Recovery — The FDDI MAC entity is attempting to recover from a logical ring fault such as failure of the duplicate address test, a local or remote stuck beaconing condition, or ring operational oscillation. Off Maintenance — The FDDI MAC entity is performing loopback testing and online diagnostics as directed by DECelms or SMT commands. Broken — A hardware problem exists.

Table 5–4 (Cont.): FDDI Line Status Display Fields

Display Field	Description
Duplicate Address Condition	The result of the Duplicate Address Test performed by the FDDI MAC entity of the station: Unknown — The FDDI MAC entity is performing the duplicate address test to determine if any other stations on the ring have the same address as the line. Absent — The FDDI MAC entity determined that there is no duplicate of its own line address on the ring. Present — The FDDI MAC entity determined that a duplicate of its own line address exists on the ring. No data can be transmitted or received on the line until this logical ring fault is resolved.
Ring Purger State	The state of the ring purger algorithm of the station's FDDI MAC entity: Purger Off — The ring purger algorithm is not active because the ring is not operational. Candidate — The ring is operational and the FDDI MAC entity is bidding to become the ring purger by sending Candidate Hello frames to the ring purger multicast address. The station with the highest station ID becomes the ring purger. Non Purger — The ring is operational and the FDDI MAC entity is not the ring purger, either because another station won the candidate bidding or because this line has a duplicate address. Purger — The ring is operational and the FDDI MAC entity is serving as ring purger, constantly purging the ring of fragments and no-owner frames. The station periodically sends Ring Purger Hello frames to the ring purger multicast address.

Table 5–4 (Cont.): FDDI Line Status Display Fields

Display Field	Description
Claim Token Yield	A flag that when set to True indicates that the FDDI MAC entity will yield unconditionally in the claim token process. The FDDI MAC entity sets this flag to True as a safeguard when it believes that its own line address is a duplicate address. If a station with a duplicate address won the claim token process, the ring might never become operational.
Target TRT	The target token rotation time (TTRT) that is being used by all the stations on the ring. The TTRT is negotiated during the claim token process. The negotiated TTRT value is referred to as T_Neg in the ANSI FDDI specifications.
Upstream Neighbor Address	The 48-bit hardware address of the station that is on the upstream side of the ring from this station. DECelms displays None if the upstream station is not sending SMT Neighborhood Information (NIF) frames.
UNA Timed Out	A flag that when set to True indicates that the FDDI MAC entity has not received an SMT Neighborhood Information frame (NIF) from its upstream neighbor for 90 seconds.
Ring Error Reason	The reason there is an error condition on the ring, or No Reason if the ring is operating correctly: No Reason — the ring is operating correctly. Initialization Initiated — The FDDI MAC entity of this station initiated the claim token process because it detected a configuration change or a missing token. Initialization Received — Another station initiated the claim token process because it detected a configuration change or a missing token.

Table 5–4 (Cont.): FDDI Line Status Display Fields

Display Field	Description
	Beaconing Initiated — A station initiated the ring beacon process because its TRT timer expired before the claim token process recovered the ring. The beacon process locates the ring break. The station downstream from the break will be stuck beaconing. (A station is stuck beaconing when its FDDI MAC entity has been beaconing longer than the time defined by the ANSI FDDI parameter T_ Stuck.)
	Duplicate Address Detected — A station detected a duplicate of its own address.
	Duplicate Token Detected — A station received a token while holding the token.
	Purge Error — The station serving as the ring purger received a token when it was not expecting one. The station expects two void frames and then the token when it is serving as the ring purger.
	Bridge Strip Error — A station using bridge frame stripping received a token before decrementing its Sent count to zero. In bridge strip mode, the station maintains a Sent count of frames sent since obtaining the token, and decrements the count each time one of its frames returns.
	OP Oscillation — The ring is suffering from ring OP (operational) oscillation, where it repeatedly comes up briefly and then goes back into initialization. This problem is frequently caused by a duplicate address condition.
	Directed Beacon Received — A station that is stuck beaconing has sent a frame to the directed beacon multicast address, indicating the suspected cause of the ring break. (A station is stuck beaconing when its FDDI MAC entity has been beaconing longer than the time defined by the ANSI FDDI parameter T_Stuck.) This is the last recovery procedure before initiating the PC trace.

Table 5–4 (Cont.): FDDI Line Status Display Fields

Display Field	Description
	PC Trace Initiated — A station that is stuck beaconing has forced its upstream neighbors to perform their self tests. (A station is stuck beaconing when its FDDI MAC entity has been beaconing longer than the time defined by the ANSI FDDI parameter T_Stuck.) PC trace is the most drastic fault recovery procedure.

5.1.3 Checking Physical Port Status

When a physical port (PHY entity) on a DECbridge 500 or DECconcentrator 500 is the command domain, the SHOW STATUS command displays the operational state of the physical port. The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

To display the status of a specific physical port, enter PHYPORT and the number of the physical port. The following command displays the status of physical port 3B on the wiring concentrator GRANDCENTRAL:

```
ELMS> SHOW GRANDCENTRAL PHYPORT 3B STATUS
```

The physical port on a DECbridge 500 is always number 1. The following commands display the status of the physical port on the DECbridge 500 named JAMESRIVER.

```
ELMS> USE JAMESRIVER PHYPORT 1
ELMS> SHOW STATUS
```

To display the status of all the physical ports on a DECconcentrator 500, make KNOWN PHYPORTS the command domain. The following commands send the status of all the physical ports on the wiring concentrator NORTHSTATION to the file NORTHSTATION.STATUS:

```
ELMS> USE NORTHSTATION KNOWN PHYPORTS
ELMS> SHOW STATUS TO NORTHSTATION.STATUS
```

An example of the SHOW STATUS display for a physical port follows. Table 5–5 describes the fields of this display. The display header shows the current date and time, along with the name, address, and line number of the target bridge or wiring concentrator.

```
Phy Port Status for Port 1                  As of: 27-APR-1990 11:22:06
Name: VAUXHALL                            Address: 08-00-2B-0C-1A-A7

Physical Port State:                  IN USE
Neighbor Physical Port Type:          Master
Reject Reason:
Physical Link Error Estimate:         5
```

Table 5–5: Physical Port Status Display Fields

Display Field	Description
Physical Port State	The operational state of the physical port: OFF MAINTENANCE — The physical port is reserved for diagnostic testing and loopbacks. BROKEN — The physical port has failed its diagnostic tests and is nonoperational. OFF READY — The physical port was disabled with the DECelms command DISABLE. WAITING — The physical port is beginning to establish a connection and waiting for a response from its neighbor physical port. STARTING — The physical port has received a response from its neighbor physical port and is now exchanging information and performing the link confidence test (LCT) before completing the connection. FAILED — Same as WAITING, except that the physical port has failed at least once—by failing the link confidence test (LCT) during initialization, by exceeding the link error monitor (LEM) threshold during operation, or because it is part of an illegal topology. WATCHING — Same as STARTING, except that the physical port has failed at least once—by failing the link confidence test (LCT) during initialization, by exceeding the link error monitor (LEM) threshold during operation, or because it is part of an illegal topology. IN USE — The physical port has a connection established and is fully operational.

Table 5–5 (Cont.): Physical Port Status Display Fields

Display Field	Description
Neighbor Physical Port Type	The type of the neighbor physical port, or Unknown if there is no connection yet. A—The physical port on a dual attachment wiring concentrator (DAC) or dual attachment station (DAS) that connects to the incoming primary ring and the outgoing secondary ring of the FDDI dual ring. B—The physical port on a dual attachment wiring concentrator (DAC) or dual attachment station (DAS) that connects to the outgoing primary ring and the incoming secondary ring of the FDDI dual ring. Master—One of the physical ports on a wiring concentrator that connects to a single attachment station (SAS) such as a DECbridge 500. Slave—The physical port on a single attachment station (SAS) that connects to a wiring concentrator or another SAS. Unknown—no connection has been established.

Table 5–5 (Cont.): Physical Port Status Display Fields

Display Field	Description
Reject Reason	The reason that the last connection on the physical port was lost. This field is updated everytime the physical port loops through the FAILED and WATCHING states. No Reason — The physical port is initializing. This value is cleared when the physical port enters the IN USE state. LCT Local — The link confidence test (LCT) failed on this physical port. LCT Remote — The link confidence test (LCT) failed on the neighbor physical port. LCT Both — The link confidence test (LCT) failed on both this physical port and the neighbor physical port. LEM Failure — The bit error rate on the physical port exceeded the link error monitor (LEM) threshold. The LEM monitors the quality of the link during operation. Topology Rules — The neighbor physical port is an illegal match for this physical port; for example, an A and an A or a Master and a Master. TNE Expired — The noise timer expired because a single noise event lasted for more than 1.31072 milliseconds. The noise timer is operational only when the physical port is IN USE. Remote Reject — The neighbor physical port broke the connection for an unknown reason. Trace in Progress — The physical port was initializing when a PC trace occurred. When a PC trace occurs, any physical ports that have not yet established a connection are shut down to prevent the toplogy from changing.

Table 5–5 (Cont.): Physical Port Status Display Fields

Display Field	Description
	Trace Received, Trace Off — The physical port was momentarily disabled because it received a PC trace when its own PC trace function was disabled. The Trace Disable switch is a feature of Digital's implementation designed to protect the physical port from faulty implementations of the PC trace algorithm. The Trace Disable switch is not remotely manageable.
Physical Link Error Estimate	The current link error rate as estimated by the link error monitor (LEM). For a value of *n*, the actual rate is 10 to the negative *n*th.

5.2 Displaying Characteristics

This section explains how to use the SHOW CHARACTERISTICS command to display bridge and wiring concentrator characteristics. You can display the status of the device as a whole (see Section 5.2.1), the status of each line on the device (see Section 5.2.2), or the status of each physical port (see Section 5.2.3).

5.2.1 Checking Device Characteristics

When a bridge or wiring concentrator is the command domain, the SHOW CHARACTERISTICS command displays information about the device hardware, firmware, and software. It also displays the settings of the hardware and software switches that control device operation. SHOW CHARACTERISTICS displays information about LAN Bridge 100 and LAN Bridge 150 models that are serving as LAN Traffic Monitor (LTM) listeners. For a description of the SHOW CHARACTERISTICS display for a device, see the following sections:

- Bridge—Section 5.2.1.1
- Wiring Concentrator—Section 5.2.1.2

The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.) The following command displays the characteristics of the bridge BATTERSEA:

```
ELMS> SHOW BATTERSEA CHARACTERISTICS
```

The following commands write the characteristics of the wiring concentrator GRANDCENTRAL to the file GRAND.CHAR:

```
ELMS> USE GRANDCENTRAL
ELMS> SHOW CHARACTERISTICS TO GRAND.CHAR
```

By making KNOWN BRIDGES or KNOWN CONCENTRATORS the command domain, you can display the characteristics of all the bridges or wiring concentrators listed in the DECelms registry that are able to respond to DECelms commands. The following command sends the characteristics of all bridges listed in the DECelms registry to the file BRIDGE.CHARACTERISTICS:

```
ELMS> SHOW KNOWN BRIDGES CHARACTERISTICS TO BRIDGE.CHARACTERISTICS
```

When KNOWN DEVICES is the command domain, SHOW CHARACTERISTICS displays the characteristics of all bridges and wiring concentrators listed in the DECelms registry that are able to respond to DECelms commands. The following commands display the characteristics of all the active devices listed in the DECelms registry:

```
ELMS> USE KNOWN DEVICES
ELMS> SHOW CHARACTERISTICS
```

5.2.1.1 Bridge Characteristics Display

This section describes the SHOW CHARACTERISTICS display for all models of bridges. Table 5–6 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target bridge. N/A appears in a display field if the field does not apply to the model of bridge being monitored. Depending on your terminal type, you may have to press the down arrow key (⇩) or the next screen key (Next Screen) to view the entire display. An example of the SHOW CHARACTERISTICS display for a LAN Bridge 200 follows.

```
Show Device Characteristics                    As of: 27-APR-1990 11:19:12
Name: BLACKFRIARS                               Address: 08-00-2B-0C-1A-A7
```

```
Node ID (root priority/address):                  128/08-00-2B-0C-1A-A7
Software Implementation Type:                     DEBAM
Software Version:                                 1.2
ROM Implementation Type:                          DEBAM
ROM Version:                                      1.2
Hardware Version Number:                          1.0
LAN Bridge 100 Spanning Tree Version:             2
802 Spanning Tree Version:                        0
Max Forwarding Database Entries:                  15871
Max Nonvolatile Forwarding Database Entries:      400
Max Protocol Database Entries:                    64547
Nonvolatile Protocol Database Entries:            300
Forwarding Database Purge Threshold:              15614
Port Count:                                       2
Downline Load Switch:                             Disabled
Downline Load File Name:
Downline Load Physical Switch:                    Disabled
Last Load Host:                                   AA-00-04-00-32-A3
Upline Dump Switch:                               Enabled
Preferred Dump Host:                              AA-00-04-00-32-A3
Last Dump Host:                                   AA-00-04-00-32-A3
Bridge Only Switch:                               Enabled
Reset Defaults Switch:                            Disabled
Port Test Passed Threshold:                       10
Port Test Interval:                               60
Topology Change Timer:                            0
Manual Filter Switch:                             False
Update Switch:                                    N/A
Fragmentation Switch:                             N/A
```

Table 5–6: Bridge Characteristics Display Fields

Display Field	Description
Node ID (root priority/address)	The bridge's spanning tree identification. This consists of the bridge's root priority (128 by default or assigned with DECelms) followed by its address (assigned during manufacturing). For the LAN Bridge 150 and LAN Bridge 200 models, the line address with the lower hexadecimal value is used for the address portion of the Node ID. For the DECbridge 500 model, the address of the Ethernet/IEEE 802.3 line is used as the address portion of the Node ID.
Software Implementation Type	The type of software running on the bridge.

Table 5–6 (Cont.): Bridge Characteristics Display Fields

Display Field	Description
Software Version	The version number of the software running on the bridge and stored in its EEPROM. (This is also the firmware version number.) For the DECbridge 500, the value in this field should change after you down-line load a firmware upgrade.
ROM Implementation Type	The type of read-only memory (ROM) on the bridge. This field applies only to the LAN Bridge 200 and the DECbridge 500.
ROM Version	The version number of the software stored in ROM. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Hardware Version Number	The version number of the bridge's hardware. This field applies only to the LAN Bridge 200 and the DECbridge 500.
LAN Bridge 100 Spanning Tree Version	The version number of the spanning tree algorithm being used by a bridge in the LAN Bridge 100 Spanning Tree Mode. This field applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
802 Spanning Tree Version	The version number of the spanning tree algorithm being used by a bridge in the 802 Spanning Tree Mode. This field applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Max Forwarding Database Entries	The maximum number of address entries that the bridge can store in its volatile memory.
Max Nonvolatile Forwarding Database Entries	The maximum number of permanent address entries that the bridge can store in its nonvolatile memory (NVRAM). These permanent entries can be added only with the DECelms command ADD ADDRESS, as described in Section 4.1.4.

Table 5–6 (Cont.): Bridge Characteristics Display Fields

Display Field	Description
Max Protocol Database Entries	The maximum number of protocol entries that the bridge can store in its protocol database. These entries control the disposition of frames based on their Ethernet Protocol Type, IEEE 802.2 LSAP protocol value, or IEEE 802.2 SNAP Protocol ID. This number includes the permanent protocol entries that are stored in both volatile and non-volatile memory, as well as those that are stored only in volatile memory. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Max Nonvolatile Protocol Database Entries	The maximum number of protocol entries that the bridge can store in its nonvolatile memory. These permanent entries are retained even if a power-down or reset occurs. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Forwarding Database Purge Threshold	The total number of active and inactive address entries that will trigger a purge of the inactive entries. This value is not configurable.
Port Count	The number of lines on the bridge.
Downline Load Switch	The setting of a software switch that controls whether the bridge will request a down-line load of software. When the switch is set to True, the bridge will request a down-line load of software upon initialization, even if the hardware switch with the same function is set to OFF (Disabled). When this switch is set to False, the bridge does not request a down-line load. Instead, the bridge loads the bridge software stored in its NVRAM during initialization. The DECelms command SET LOAD SWITCH sets the Down-Line Load switch, as described in Section 2.5.2. This field does not apply to the DECbridge 500.
Downline Load File Name	The software identification of the file that the bridge will request from the down-line load host. The DECelms command SET LOAD FILE enters this information, as described in Section 2.5.3. This field does not apply to the DECbridge 500.

Table 5–6 (Cont.): Bridge Characteristics Display Fields

Display Field	Description
Downline Load Physical Switch	The setting of the hardware switch that, when set to ON, instructs the bridge to request a down-line load of software during initialization. The software switch with the same function can cause the bridge to request a down-line load even when this hardware switch is set to OFF (Disabled). See the description of the Downline Load Switch display field. This field does not apply to the DECbridge 500.
Last Load Host	The physical address of the last host, if any, that responded to the bridge's request for a down-line load of software. DECelms displays None if the bridge has not been down-line loaded with software. This field applies only to the LAN Bridge 200.
Upline Dump Switch	The setting of the software switch that, when enabled, causes the bridge to request an up-line dump of its memory image and register contents after a fatal error occurs. The DECelms command SET DUMP SWITCH sets this switch, as described in Section 2.4.2. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Preferred Dump Host	The physical address of the host to which the bridge will send its initial up-line dump request. The DECelms command SET DUMP HOST enters this information, as described in Section 2.4.3. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Last Dump Host	The physical address of the last host, if any, that received an up-line dump from this bridge. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Bridge Only Switch	The setting of a hardware switch that, when enabled, prevents the bridge from serving as a LAN Bridge 200 Line Monitor when only one line is forwarding. This field applies only to the LAN Bridge 200.
Reset Defaults Switch	The setting of a hardware switch that, when enabled, causes the bridge to reset its spanning tree parameters to the factory default values during initialization. This switch applies only to the LAN Bridge 200 and the DECbridge 500.

Table 5–6 (Cont.): Bridge Characteristics Display Fields

Display Field	Description
Port Test Passed Threshold	The number of consecutive successful self-tests needed before the bridge considers a line to be operational. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Port Test Interval	The interval, in seconds, at which the bridge will run self-tests on a line that is in the BROKEN state. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Topology Change Timer	The number of seconds remaining before the bridge will recompute its internal spanning tree databases as a safeguard against corruption. The bridge executes the spanning tree algorithm when this timer expires, when the bridge detects a change in the status of one of its lines, and whenever there is a topology change in the network.
Manual Filter Switch	The setting of a software switch that controls LAN Bridge 200 address filtering. When this switch is set to True, the bridge purges the learned entries from its forwarding database, stops its learning process, and forwards only frames with source **and** destination addresses that have management entries with the disposition FORWARD. When this switch is set to False, the bridge forwards frames with unknown addresses and adds learned entries to its forwarding database. This field applies only to the LAN Bridge 200.
Update Switch	The setting of a software switch that, when set to True (enabled), instructs the bridge to accept a down-line loaded firmware upgrade. The firmware upgrade overwrites the firmware stored in the bridge's ROM. When this switch is set to False (disabled), the bridge will not accept down-line loaded firmware upgrades. The SET UPDATE SWITCH command controls the setting of the Update software switch. This field applies only to the DECbridge 500.

Table 5–6 (Cont.): Bridge Characteristics Display Fields

Display Field	Description
Fragmentation Switch	The setting of a software switch that controls the fragmentation of Internet Protocol (IP) frames by a DECbridge 500. When enabled, the bridge breaks large IP frames received on its FDDI line into smaller frames that can be transmitted on its Ethernet/IEEE 802.3 line. This fragmentation is necessary because the maximum data size for a frame on an FDDI ring is 4500 octets, but only 1500 octets for a frame on an Ethernet/IEEE 802.3 segment. The bridge does not fragment frames containing other protocols. The SET FRAGMENTATION SWITCH command controls the setting of the Fragmentation software switch, as described in Section 2.7. This field applies only to the DECbridge 500.

5.2.1.2 Wiring Concentrator Characteristics Display

This section describes the SHOW CHARACTERISTICS display for a wiring concentrator. Table 5–7 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target wiring concentrator. An example of the SHOW CHARACTERISTICS display for a wiring concentrator follows.

```
Show Device Characteristics                     As of: 27-APR-1990 11:19:12
Name: BLACKFRIARS                                Address: 08-00-2B-0C-1A-A7

Node ID:                                            08-00-2B-0C-1A-A7
Software Implementation Type:                       DEFCN
Software Version:                                   1.0
ROM Implementation Type:                            DEFCN
ROM Version:                                        1.1
Hardware Version Number:                            1.0
Upline Dump Switch:                                 Enabled
Preferred Dump Host:                                AA-00-04-00-32-A3
Last Dump Host:                                     AA-00-04-00-32-A3
Reset Defaults Switch:                              Disabled
Update Switch:                                      True
```

Table 5–7: Wiring Concentrator Characteristics Display Fields

Display Field	Description
Node ID	The wiring concentrator's address, which is assigned during manufacturing.
Software Implementation Type	The type of software running on the wiring concentrator.
Software Version	The version number of the software running on the wiring concentrator. (This is also the firmware version number.)
ROM Implementation Type	The type of read-only memory (ROM) on the wiring concentrator.
ROM Version	The version number of the software stored in ROM.
Hardware Version Number	The version number of the wiring concentrator's hardware.
Upline Dump Switch	The setting of the software switch that, when enabled, causes the wiring concentrator to request an up-line dump of its memory image and register contents after a fatal error occurs. The DECelms command SET DUMP SWITCH sets this switch, as described in Section 2.4.2.
Preferred Dump Host	The physical address of the host to which the wiring concentrator will send its initial up-line dump request or None if no host is defined. The DECelms command SET DUMP HOST enters this information, as described in Section 2.4.3.
Last Dump Host	The physical address of the last host, if any, that received an up-line dump from this wiring concentrator. DECelms displays None if the wiring concentrator has not sent any up-line dumps.
Reset Defaults Switch	The setting of a hardware switch that, when enabled, causes the wiring concentrator to reset its parameters to the factory default values during initialization.

Table 5–7 (Cont.): Wiring Concentrator Characteristics Display Fields

Display Field	Description
Update Switch	The setting of a software switch that, when set to True (enabled), instructs the wiring concentrator to accept a down-line loaded firmware upgrade. The firmware upgrade overwrites the firmware stored in the bridge's ROM. When this switch is set to False (disabled), the bridge will not accept down-line loaded firmware upgrades. The SET UPDATE SWITCH command controls the setting of the Update software switch.

5.2.2 Displaying Line Characteristics

When a bridge or wiring concentrator line is the command domain, the SHOW CHARACTERISTICS command displays the characteristics of the line: its address, port number, data link type, physical medium type, and software switch settings. For a description of the SHOW CHARACTERISTICS display for a line, see the following sections:

- Bridge Ethernet/IEEE 802.3 line—Section 5.2.2.1
- Bridge or Wiring Concentrator FDDI line—Section 5.2.2.2

The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

To display the characteristics of a specific line, enter LINE and the line number. The following commands display the characteristics of line 2 on the bridge PONTNEUF:

```
ELMS> USE PONTNEUF LINE 2
ELMS> SHOW CHARACTERISTICS
```

DECconcentrator 500 models have only one line, line 1. The following command displays the characteristics of the line on the wiring concentrator PENNSTATION:

```
ELMS> SHOW PENNSTATION LINE 1 CHARACTERISTICS
```

To display the characteristics of both lines on a bridge, make KNOWN LINES the command domain. The following commands send the characteristics of both lines on the bridge VAUXHALL to the file VAUXHALL.CHARACTERISTICS:

```
ELMS>USE VAUXHALL KNOWN LINES
ELMS>SHOW CHARACTERISTICS TO VAUXHALL.CHARACTERISTICS
```

5.2.2.1 Bridge Ethernet/IEEE 802.3 Line Characteristics Display

This section describes the SHOW CHARACTERISTICS display for a bridge Ethernet/IEEE 802.3 line. It applies to all bridge models. Table 5–8 describes the fields of this display. The display header shows the current date and time, along with the name and address of the bridge that contains the line being monitored. N/A appears in a display field if the field does not apply to the model of bridge being monitored. An example of the SHOW STATUS display for a LAN Bridge 200 Ethernet/IEEE 802.3 line follows.

```
Line Characteristics for Line 1                 As of: 27-APR-1990 11:22:06
Name: VAUXHALL                                   Address: 08-00-2B-0C-1A-A7

Port Address:                       08-00-2B-0C-1A-A7
Port Number:                        1
Datalink Type:                      Ethernet CSMA/CD
Physical Medium Type:               Standard AUI interface ("D" Connector)
Management Sets Allowed Switch:     Enabled
Collision Presence Test Switch:     Disabled
```

Table 5–8: Bridge Ethernet/IEEE 802.3 Line Characteristics Display Fields

Display Field	Description
Port Address	The hardware address of this line. On LAN Bridge 100 models, both lines have the same address, which is also the bridge address. On the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, each line has a different hardware address. This field applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Port Number	The number of this line.
Datalink Type	The Data Link (layer 2) protocol used on the physical transmission medium to which this line is attached: Ethernet CSMA/CD or IEEE 802.3 CSMA/CD.

Table 5–8 (Cont.): Bridge Ethernet/IEEE 802.3 Line Characteristics Display Fields

Display Field	Description
Physical Medium Type	The type of physical transmission medium to which this line is attached. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Management Sets Allowed Switch	The setting of the Port Access hardware switch for this line. When this switch is enabled, the line's parameters can be modified with the DECelms command SET and software can be down-line loaded into the bridge through the line. When this switch is disabled, DECelms can only read the line's parameters, counters, and status.
Collision Presence Test Switch	The setting of a software switch that informs the bridge whether the transceiver on this line is using the Collision Presence Test (CPT), commonly known as "heartbeat." The switch is set with the DECelms command SET CPT; it must be enabled if the line's transceiver has CPT or disabled if it does not have CPT. For more information on SET CPT, see Section 3.2.

5.2.2.2 Bridge or Wiring Concentrator FDDI Line Characteristics Display

This section describes the SHOW CHARACTERISTICS display for an FDDI line on a DECbridge 500 or a DECconcentrator 500. Many of the fields in this display show the characteristics of the FDDI MAC entity of the station. Table 5–9 describes the fields of this display. The display header of this display shows the current date and time, along with the name and address of the device that contains the line being monitored. An example of the SHOW CHARACTERISTICS display for the line on a DECconcentrator 500 follows.

```
Line Characteristics for Line 1    As of: 27-APR-1990 11:22:06
Name: GRANDCENTRAL                  Address: 08-00-2B-0C-1A-A7
```

```
Link Address:                     08-00-2B-0C-1A-A7
Port Number:                      1
Datalink Version:                 1.0
Datalink Type:                    FDDI
Station ID:                       00-00-08-00-2B-0C-1A-A7
Station Type:                     Dual Attachment Concentrator
Management Sets Allowed Switch:   Enabled
Maximum TRT:                      173.0150 ms
Requested TRT:                    8.0 ms
Valid Transmission Time:          2.6214 ms
SMT Version ID:                   1.0
Path Latency Ring One:            0.01080 ms
Path Latency Ring Two:            0.00112 ms
SMT Resource Index:               11
Frame Strip Mode:                 SA Match
```

Table 5–9: Bridge or Wiring Concentrator FDDI Line Characteristics Display Fields

Display Field	Description
Link Address	The 48-bit hardware address of this line. On DECbridge 500 devices, each line has a different address. For a DECconcentrator 500 this is the device address, because DECconcentrator 500 models have only one line.
Port Number	The number of this line.
Datalink Version	The version number of the Data Link (layer 2) protocol used on the physical transmission medium to which this line is attached.
Datalink Type	The Data Link (layer 2) protocol used on the physical transmission medium to which this line is attached: FDDI, Ethernet CSMA/CD, or IEEE 802.3 CSMA/CD.
Station ID	The SMT station ID of the bridge or wiring concentrator. The first two bytes are zero; the last six bytes are the IEEE universally administered 48-bit hardware address of the line. For a DECconcentrator 500 this is the device address, because DECconcentrator 500 models have only one line.

Table 5–9 (Cont.): Bridge or Wiring Concentrator FDDI Line Characteristics Display Fields

Display Field	Description
Station Type	The type of the station: SAS (Single Attachment Station) — A station that has a single connection to the FDDI ring through a wiring concentrator. DAS (Dual Attachment Station) — A station that is connected to both the primary and secondary rings of the FDDI dual ring. SAC (Single Attachment Concentrator) — A wiring concentrator that has a single connection to the FDDI dual ring through another wiring concentrator. DAC (Dual Attachment Concentrator) — A wiring concentrator that is connected to both the primary and secondary ring of the FDDI dual ring. NAC (No Attachment Concentrator) — A standalone wiring concentrator that is not connected to an FDDI dual ring, but instead provides FDDI communications for a group of single attachment or dual attachment stations. This is sometimes referred to as an unrooted configuration.
Management Sets Allowed Switch	The setting of the Port Access hardware switch for this line. When this switch is enabled, the line's parameters can be modified with DECelms commands and software can be down-line loaded into the device through the line. When this switch is disabled, DECelms can only read the line's parameters, counters, and status.
Maximum TRT	The maximum token rotation time (the ANSI FDDI parameter T_Max) that the FDDI MAC entity will allow to be negotiated in the claim token process. This value is set for the line by the DECelms command SET MAXIMUM TRT, as described in Section 3.5. The default value is 173.0150 milliseconds.

Table 5–9 (Cont.): Bridge or Wiring Concentrator FDDI Line Characteristics Display Fields

Display Field	Description
Requested TRT	The token rotation time (the ANSI FDDI parameter T_Req) that the FDDI MAC entity will initially request in the claim token process. This value is set for the station by the DECelms command SET REQUESTED TRT, as described in Section 3.4. The default value is 8.0 milliseconds.
Valid Transmission Time	The valid transmission time (TVX) used by the FDDI MAC entity. If the FDDI MAC entity does not receive a valid frame or unrestricted token within the valid transmission time, it initializes the ring. This value is set for the line by the DECelms command SET TVX, as described in Section 3.6. The default value is 2.6214 milliseconds.
SMT Version ID	The version number of the FDDI Station Management (SMT) protocol used on the station. Note that this is not the revision number of the SMT standard document.
Path Latency Ring One	The time, in milliseconds, that it takes for a symbol pair to pass through the station on the primary ring.
Path Latency Ring Two	The time, in milliseconds, that it takes for a symbol pair to pass through the station on the secondary ring. This field does not apply to the DECbridge 500.
SMT Resource Index	The index assigned to the FDDI MAC entity of this station. This index is used by the FDDI Station Management (SMT) protocol to identify the FDDI MAC entity.
Frame Strip Mode	The frame strip mode used by the station: SA Match — The station strips frames from the ring that contain its own address in the source address field.

Table 5–9 (Cont.): Bridge or Wiring Concentrator FDDI Line Characteristics Display Fields

Display Field	Description
	Bridge Strip — The station maintains a Sent count of frames sent since obtaining the token, sends a void frame when the transmission is complete (two void frames if it is serving as ring purger), and strips the returning frames from the ring until its Sent count is decremented to zero. Bridge stripping is used by bridges, because they are sensitive to no-owner frames and frequently send frames that do not contain their own address in the source address field.

5.2.3 Displaying Physical Port Characteristics

When a physical port (PHY entity) on a DECbridge 500 or DECconcentrator 500 is the command domain, the SHOW CHARACTERISTICS command displays the type, LEM threshold, and PMD type of the physical port. The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

To display the characteristics of a specific physical port, enter PHYPORT followed by the physical port number. The following command displays the characteristics of physical port 4C on the wiring concentrator PENNSTATION:

```
ELMS> SHOW PENNSTATION PHYPORT 4C CHARACTERISTICS
```

On the DECbridge 500, the physical port is always number 1. The following commands display the characteristics of the physical port on the DECbridge 500 named JAMESRIVER:

```
ELMS> USE JAMESRIVER PHYPORT 1
ELMS> SHOW CHARACTERISTICS
```

To display the characteristics of all the physical ports on a DECconcentrator 500, make KNOWN PHYPORTS the command domain. The following commands send the characteristics of all the physical ports on the wiring concentrator NORTHSTATION to the file NORTHSTATION.CHAR:

```
ELMS> USE NORTHSTATION KNOWN PHYPORTS
ELMS> SHOW CHARACTERISTICS TO NORTHSTATION.CHAR
```

An example of the SHOW CHARACTERISTICS display for a physical port follows. Table 5–10 describes the fields of this display. The display header shows the current date and time, along with the name, address, and line number of the target bridge or wiring concentrator.

```
Phy Port Characteristics for Port 1          As of: 27-APR-1990 11:22:06
Name: VAUXHALL                                 Address: 08-00-2B-0C-1A-A7

Physical Port Type:                Slave
LEM Threshold:                     4
PMD Type:                          Multi Mode
```

Table 5–10: Physical Port Characteristics Display Fields

Display Field	Description
Physical Port Type	The physical port type: A—The physical port on a DECconcentrator 500 that connects to the incoming primary ring and the outgoing secondary ring of the FDDI dual ring. B—The physical port on a DECconcentrator 500 that connects to the outgoing primary ring and the incoming secondary ring of the FDDI dual ring. Master—One of the physical ports on a DECconcentrator 500 that connects to a single attachment station (SAS) such as a DECbridge 500. Slave—The physical port on a DECbridge 500 or a single attachment concentrator (SAC) that connects to a DECconcentrator 500 or another single attachment station (SAS).

Table 5–10 (Cont.): Physical Port Characteristics Display Fields

Display Field	Description
LEM Threshold	The link error monitor (LEM) threshold set for the physical port. The LEM monitors the bit error rate (BER) on the physical port during normal operation. When the bit error rate rises above the LEM threshold, the station disables the physical port, preventing it from disrupting the ring. The LEM threshold is expressed as the absolute value of the exponent of the bit error rate. The legal range for the threshold is 5 through 8, corresponding to the range of bit error rates, which is 10 to the -5th (0.00001) bit errors per second through 10 to the -8th (0.00000001) bit errors per second. This value is set for the physical port by the DECelms command SET LEM THRESHOLD, as described in Section 3.8.1.
PMD Type	The type of physical medium to which this physical port is attached: Multi Mode — Inexpensive thick core fiber combined with light emitting diode (LED) sources and p-type intrinsic n-type (PIN) detectors. Single Mode — Expensive thin core fiber combined with laser diode sources and avalanche photo diode (APD) detectors.

5.3 Displaying Spanning Tree Parameter Values

This section explains how to use the SHOW SPANNING CHARACTERISTICS command to display a bridge's spanning tree parameter values. You can display the parameters that apply to the bridge as a whole (see Section 5.3.1) or those that are specific to each line on the bridge (see Section 5.3.2). You cannot display the spanning tree parameter values of a bridge that is serving as a LAN Traffic Monitor (LTM) listener; in that case, SHOW CHARACTERISTICS is the only valid monitoring command.

5.3.1 Displaying Bridge Spanning Tree Parameter Values

When a bridge is the command domain, the SHOW SPANNING CHARACTERISTICS command displays the spanning tree parameters that apply to the bridge as a whole. The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.) The following commands display the bridge spanning tree parameter settings of the bridge WATERLOO:

```
ELMS> USE WATERLOO
ELMS> SHOW SPANNING CHARACTERISTICS
```

By making KNOWN BRIDGES the command domain, you can display the bridge spanning tree parameter settings of all the bridges listed in the DECelms registry that are able to respond to DECelms commands. The following command sends the spanning tree parameter values of all the bridges listed in the DECelms registry to the file BRIDGE.SPAN:

```
ELMS> SHOW KNOWN BRIDGES SPANNING CHARACTERISTICS TO BRIDGE.SPAN
```

An example of the SHOW SPANNING CHARACTERISTICS display for a bridge follows (the display shown is for a LAN Bridge 200). Table 5–11 and Table 5–12 describe the fields of this display. The display header shows the current date and time, along with the name and address of the target bridge. N/A appears in a display field if the field does not apply to the model of bridge being monitored. Depending on your terminal type, you may have to press the down arrow key (⇓) or the next screen key (Next Screen) to view the entire display.

```
Show Device Spanning Characteristics    As of: 27-APR-1990 11:20:21
Name: WATERLOO                           Address: 08-00-2B-0C-1A-A7

Best Root:                                      10 / 08-00-2B-0C-1A-A7
Best Root Age:                                  1
My Cost:                                        40
Inlink:                                         2
Topology Change Flag:                           False
Tell Parent Flag:                               False
Actual Hello Interval:                          1
Actual Listen Time:                             15
Actual Forwarding Delay:                        30
Root Priority:                                  128
Forwarding Database Normal Aging Time:          120
Forwarding Database Short Aging Time:           30
Bad Hello Limit:                                15
Bad Hello Reset Interval:                       5
No Frame Interval:                              300
```

```
LAN Bridge 100 Poll Time:                        300
LAN Bridge 100 Response Timeout:                 15
Hello Interval:                                  1
Listen Time:                                     15
Forwarding Delay:                                30
LAN Bridge 100 Spanning Tree Compatibility:      Auto-Select
```

Table 5–11: Bridge Spanning Characteristics Display Fields for Nonsettable Parameters

Display Field	Description
Best Root	The bridge identification (root priority/bridge address) of the bridge that this bridge believes to be the root bridge.
Best Root Age	The age, in seconds, of the Hello message that established the Best Root. When the value of the Best Root Age parameter exceeds the value of the Listen Time parameter, the bridge assumes that the topology has changed and sends out Hello messages on both its lines, declaring itself to be the root bridge.
My Cost	This bridge's current path cost to the root bridge. This path cost is the total of all Line Costs on the path to the root bridge, including the Line Cost of this bridge's line on the path to the root bridge (the Inlink).
Inlink	The line number of this bridge's line on the path to the root bridge.
Topology Change Flag	A flag in the Hello message that, when set to True, indicates that the root has received a Topology Change Notification message. This flag instructs the bridges to begin using the aging time set by the Short Aging Time parameter.
Tell Parent Flag	A flag that indicates whether the bridge detected a loop condition. When the flag is set to True, the bridge received a Hello message that agreed with the bridge's root bridge but that was not received over the bridge's line to the root bridge. This indicates that there is a loop somewhere in the extended network, in addition to a malfunctioning bridge. The bridge sends a Topology Change Notification message to its parent bridge, the next closest bridge in the path to the root bridge.

Table 5–11 (Cont.): Bridge Spanning Characteristics Display Fields for Nonsettable Parameters

Display Field	Description
Actual Hello Interval	The Hello Interval that the bridge is currently using. Once the spanning tree computation process is completed, all bridges use the root bridge's Hello Interval, regardless of the Hello Interval set for the bridge with the DECelms command SET SPANNING CHARACTERISTICS. However, if the bridge becomes the root bridge, its Hello Interval will then be the Actual Hello Interval for all the bridges in the spanning tree.
Actual Listen Time	The Listen Time value that the bridge is currently using. Once the spanning tree computation process is completed, all bridges use the root bridge's Listen Time value, regardless of the Listen Time value set for the bridge with the DECelms command SET SPANNING CHARACTERISTICS. However, if the bridge becomes the root bridge, its Listen Time will then be the Actual Listen Time for all the bridges in the spanning tree.
Actual Forwarding Delay	The Forwarding Delay that the bridge is currently using. Once the spanning tree computation process is completed, all bridges use the root bridge's Forwarding Delay, regardless of the Forwarding Delay set for the bridge with the DECelms command SET SPANNING CHARACTERISTICS. However, if the bridge becomes the root bridge, its Forwarding Delay will then be the Actual Forwarding Delay for all the bridges in the spanning tree.

Table 5–12: Bridge Spanning Characteristics Display Fields for Settable Parameters

Display Field	Description
Root Priority	The priority assigned to the bridge for becoming the root of the spanning tree. The Root Priority is prepended to the bridge's address to form its bridge identification; for example: 10/08-00-2B-06-25-C7. On the LAN Bridge 150 and LAN Bridge 200 models, the line address with the lower hexadecimal value is used for the address portion of the Node ID.
Forwarding Database Normal Aging Time	The time, in seconds, that the bridge keeps learned entries active in its forwarding database during normal operation. If the bridge does not see the address of a learned entry in the source address of a frame during the time set for this parameter, the bridge marks the entry inactive. The bridge then removes the inactive entries the next time it purges its forwarding database. Each time the bridge sees the address of an entry in the source address of a frame, the bridge sets the entry's age back to zero. Forwarding database entries added with the DECelms command ADD ADDRESS are not subject to aging.
Forwarding Database Short Aging Time	The number of seconds that the bridge keeps learned entries active immediately after a topology change. For bridges in the LAN Bridge 100 Spanning Tree Mode, this period of time is the sum of the root bridge's Forwarding Delay value plus the root bridge's Short Aging Time value. For bridges in the 802 Spanning Tree Mode, the duration is half of the root bridge's Forwarding Delay value plus the root bridge's Listen Time value.
Bad Hello Limit	The number of Hello Intervals during which the bridge receives one or more bad Hello messages on a line, before the bridge performs a hardware reset and self-test on the line. A bad Hello message is one containing inferior root information that is received on a line on which the bridge is the designated bridge. (In a stable configuration, only the designated bridge sends Hello messages.)

Table 5–12 (Cont.): Bridge Spanning Characteristics Display Fields for Settable Parameters

Display Field	Description
Bad Hello Reset Interval	The number of Hello Intervals without bad Hello messages that the bridge will wait before it resets its Bad Hello Count to zero. In other words, the Bad Hello Reset Interval is the length of time that the bridge holds the Bad Hello Count even though it is not currently receiving any bad Hello messages. The bridge automatically restarts this timer each time it receives another bad Hello message. (The Bad Hello Count is a line spanning tree parameter.)
No Frame Interval	The number of seconds of idleness on a line that will cause the bridge to run its self-test. The bridge considers a line to be idle when it does not receive any frames on the line. This parameter applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
LAN Bridge 100 Poll Time	The number of seconds that the root bridge waits between polling to see if a bridge that can operate only in the LAN Bridge 100 Spanning Tree Mode is still present on the extended LAN. If the bridge does not respond within the LAN Bridge 100 Response Timeout, described below, the root bridge sends a multicast poll to see if any other LAN Bridge 100 Spanning Tree Mode bridges are present. If none respond, the root bridge and all other bridges switch to the 802 Spanning Tree Mode. Although you can set this parameter for all LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, it has effect only when the bridge is serving as the root bridge.
LAN Bridge 100 Response Timeout	The number of seconds that the root bridge will wait for a response to a poll before switching to the 802 Spanning Tree Mode. (See the description of the LAN Bridge 100 Poll Time parameter.) Although you can set this parameter for all LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models, it has effect only when the bridge is serving as the root bridge.

Table 5–12 (Cont.): Bridge Spanning Characteristics Display Fields for Settable Parameters

Display Field	Description
Hello Interval	The interval, in seconds, at which the bridge will send a Hello message on all of its lines. This parameter has an immediate effect only if the bridge is the root bridge. After the spanning tree computation process is completed, all bridges use the value set in the root bridge (and propagated by Hello messages).
Listen Time	The time, in seconds, after which the bridge considers a Hello message to be stale. When the bridge receives a Hello message from the designated bridge on one of its lines, the bridge keeps track of the age of the Hello message and increments the age every second. When the age of the last Hello message received exceeds the Listen Time, the bridge concludes that a topology change has occurred and initializes its line database. It then sends out Hello messages on both of its lines, declaring itself to be the root bridge. This parameter has an immediate effect only if the bridge is the root bridge. After the spanning tree computation process is completed, all bridges use the value set in the root bridge (and propagated by Hello messages).
Forwarding Delay	The time, in seconds, that the bridge's lines will stay in the PREFORWARDING state before entering the FORWARDING state. During the first half of the Forwarding Delay, the bridge participates in the spanning tree computation process. During the second half, the bridge learns addresses by listening to frames on both of its lines. (The bridge adds the source address and incoming line number of each frame to its forwarding database.) This parameter has an immediate effect only if the bridge is the root bridge. After the spanning tree computation process is completed, all bridges use the value set in the root bridge (and propagated by Hello messages).

Table 5–12 (Cont.): Bridge Spanning Characteristics Display Fields for Settable Parameters

Display Field	Description
LAN Bridge 100 Spanning Tree Compatibility	The LAN Bridge 100 Spanning Tree Compatibility parameter controls the spanning tree mode used by a LAN Bridge 150, a LAN Bridge 200, or a DECbridge 500. When this parameter is set to Auto-Select, the bridge uses the 802 Spanning Tree Mode unless the root bridge detects a bridge that can run only the LAN Bridge 100 Spanning Tree Mode, in which case the bridge reverts to the LAN Bridge 100 Spanning Tree Mode. Thus, the bridge is "compatible" with the LAN Bridge 100 Spanning Tree Mode. When this parameter is set to IEEE 802.1, the bridge stays in the 802 Spanning Tree Mode and is thus incompatible with the LAN Bridge 100 Spanning Tree Mode. The default value for this parameter is True. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

5.3.2 Displaying Line Spanning Tree Parameter Values

When a bridge line is the command domain, the SHOW SPANNING CHARACTERISTICS command displays the settable and nonsettable spanning tree parameters that apply to the bridge line. The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.) The following commands display the spanning tree parameter settings for line 1 of the bridge LAMBETH:

```
ELMS> USE LAMBETH LINE 1
ELMS> SHOW SPANNING CHARACTERISTICS
```

By making KNOWN LINES the command domain, you can display the spanning tree parameter settings of both lines on a bridge. The following commands send the spanning tree parameter values of both lines on the bridge GOLDENGATE to the file LINE.SPAN:

```
ELMS> USE GOLDENGATE
ELMS> SHOW KNOWN LINES SPANNING CHARACTERISTICS TO LINE.SPAN
```

An example of the SHOW SPANNING CHARACTERISTICS display for a bridge line follows (the display shown is for a LAN Bridge 200). Table 5–13 describes the fields of this display. The display header shows the current date and time, along with the name and address of the bridge that contains the line being monitored. N/A appears in a display field if the field does not apply to the model of bridge being monitored.

```
Line Spanning Characteristics for Line 1  As of: 27-APR-1990 11:21:52
Name: LAMBETH                               Address: 08-00-2B-0C-1A-A7

Local Network Module State:         FORWARDING
Port Cost:                          10
Designated Bridge ID:               128 /08-00-2B-0C-1B-A6
Designated Bridge Link Number:      1
Designated Bridge Root ID:          10 /08-00-2B-06-25-C7
Root Path Cost:                     40
Designated Root Age:                0
RTM Flag:                           N/A
Forward Delay Timer:                0
Bad Hello Count:                    0
Possible Loop Flag:                 False
Topology Changed Flag:              False
Disable Switch:                     Disabled
```

Table 5–13: Line Spanning Characteristics Display Fields

Display Field	Description
Local Network Module State	The operational state of the line: INIT — The line is in the process of initializing and cannot be used for any purpose. PREFORWARDING — The line is checking the topology and learning forwarding addresses from incoming frames. It listens to all Hello messages and learns from incoming frames, but does not forward them. FORWARDING — The line is fully operational and can perform all functions, including forwarding frames.

Table 5–13 (Cont.): Line Spanning Characteristics Display Fields

Display Field	Description
	BACKUP — The line is operational but was put in this state by the spanning tree computation process to avoid a loop in the spanning tree. The line can only listen to Hello messages that it receives and respond to management commands.
	DISABLED — The line was disabled by the DECelms command DISABLE. However, the line continues to listen to Hello messages. The line cannot be used for normal frame forwarding, does not learn forwarding addresses from received frames, and does not take part in the spanning tree computation process (that is, it does not send Hello messages).
	BROKEN — The line is broken and cannot be used for any purpose.
	This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Port Cost	The Line Cost value for this line, which the bridge uses to determine the path cost to the root bridge. (This is the only settable line spanning tree parameter.) The Line Cost may have been changed from the default value of 10 by the DECelms command SET COST. See Section 3.1 for more information on the Line Cost parameter and the SET COST command.
Designated Bridge ID	The designated bridge on this line; that is, the bridge that is on the path to the root bridge. The display shows the Root Priority of the designated bridge and its address, separated by a slash.
Designated Bridge Link Number	The line number on the designated bridge that is connected to the same LAN as this line.
Designated Bridge Root ID	The Root Priority and address of the bridge that the designated bridge on this line considers to be the root bridge. In a stable network configuration, all lines on all bridges have the same value in this field, and it corresponds to the Best Root value shown in the Bridge Spanning Characteristics display. During a topology change, or if a problem exists, these values may be different.

Table 5–13 (Cont.): Line Spanning Characteristics Display Fields

Display Field	Description
Root Path Cost	The sum of the Line Costs from the designated bridge to the root bridge.
Designated Root Age	The age, in seconds, of the last Hello message received from the designated bridge on this line.
RTM Flag	A software flag that, when set to True, indicates that the bridge can respond to DECelms commands received on the line. When this flag is set to False, the bridge cannot respond to DECelms commands received on the line. The RTM flag is set to False when a line is put into BACKUP or DISABLED mode by the spanning tree computation process. This field applies only to the LAN Bridge 100.
Forward Delay Timer	The time remaining before the line will leave the PREFORWARDING state and enter the FORWARDING state. This timer is initialized when you use DECelms to set the Forwarding Delay parameter for the bridge. This field is valid only for lines that are in the PREFORWARDING state.
Bad Hello Count	The number of Hello Intervals during which the bridge received one or more bad Hello messages on this line. Once this count reaches the Bad Hello Limit set for the bridge, the bridge resets this counter to zero, increments the Bad Hello Limit Exceeded counter by one, and initializes itself. The bridge also resets this count to zero (without initializing itself) if the Bad Hello Reset counter reaches the Bad Hello Reset Interval.
Possible Loop Flag	A flag that indicates whether the bridge detected a loop condition on this line. When this flag is set to True, the bridge received a Hello message on this line that agreed with the bridge's root bridge but was not received over the bridge's line to the root bridge. This indicates that there is a loop somewhere in the extended network, in addition to a malfunctioning bridge.
Topology Changed Flag	A flag that indicates whether the topology of the network is currently changing. When this flag is set to True, the bridge detected a change in the network topology or received this indication from another bridge.

Table 5–13 (Cont.): Line Spanning Characteristics Display Fields

Display Field	Description
Disable Switch	A software switch that, when set to True, indicates that the line has been disabled by the DECelms command DISABLE.

5.4 Displaying Counters

This section explains how to use the SHOW COUNTERS command to display bridge and wiring concentrator counters. You can display the status of the device as a whole (see Section 5.4.1), the status of each line on the device (see Section 5.4.2), or the status of each physical port (see Section 5.4.3).

5.4.1 Checking Device Counters

When a bridge or wiring concentrator is the command domain, the SHOW COUNTERS command displays the counters that apply to the device as a whole. These counters measure device operational events and errors. They are reset to zero when the bridge is initialized. For a description of the SHOW COUNTERS display for a device, see the following sections:

- Bridge—Section 5.4.1.1
- Wiring Concentrator—Section 5.4.1.2

NOTE

You cannot display the counters of a bridge that is serving as a LAN Traffic Monitor (LTM) listener; in that case, SHOW CHARACTERISTICS is the only valid monitoring command.

The optional phrase EVERY *nn* SECONDS (or EVERY *nn* MINUTES) causes DECelms to update the display at the specified interval. To terminate the display, press Return. The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

NOTE

If you include the EVERY phrase when the domain is KNOWN BRIDGES, you must send the output to a file.

The following command displays the counters of the bridge TOWER and instructs DECelms to update the display every 30 seconds:

```
ELMS> SHOW TOWER COUNTERS EVERY 30 SECONDS
```

The following commands display the counters of the wiring concentrator GRANDCENTRAL:

```
ELMS> USE GRANDCENTRAL
ELMS> SHOW COUNTERS
```

By making KNOWN BRIDGES or KNOWN CONCENTRATORS the command domain, you can display the counters of all the bridges or wiring concentrators listed in the DECelms registry that are able to respond to DECelms commands. The following command sends the counters of all bridges listed in the DECelms registry to the file BRIDGE.COUNTERS:

```
ELMS> SHOW KNOWN BRIDGES COUNTERS TO BRIDGE.COUNTERS
```

When KNOWN DEVICES is the command domain, SHOW COUNTERS displays the counters of all bridges and wiring concentrators listed in the DECelms registry that are able to respond to DECelms commands. The following commands display the counters of all the active devices listed in the DECelms registry:

```
ELMS> USE KNOWN DEVICES
ELMS> SHOW COUNTERS
```

5.4.1.1 Bridge Counters Display

This section describes the SHOW COUNTERS display for all models of bridges. Table 5–14 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target bridge. N/A appears in a display field if the field does not apply to the model of bridge being monitored. An example of the SHOW COUNTERS display for a LAN Bridge 200 follows.

```
Show Device Counters                    As of: 27-APR-1990 11:21:34
Name: TOWER                              Address: 08-00-2B-21-43-31

Seconds Operating:                                173445
Power Ups:                                        2
Management Resets:                                2
New Forwarding Database Entries Lost:             5
Device Frames Lost:                               0
Upline Dump Failed:                               1
Upline Dump Success:                              2
Loaded Tasks:                                     0
Spanning Tree Mode Changes:                       0
Unsolicited Resets:                               1
Invalid Passwords:                                0
```

Table 5–14: Bridge Counters Display Fields

Display Field	Description
Seconds Operating	The number of seconds since the bridge was powered on.
Power Ups	The number of times that the bridge was powered on. Power Ups, Management Resets, and Unsolicited Resets are all mutually exclusive.
Management Resets	The number of times that the bridge was initialized by a DECelms command. The DECelms commands INITIALIZE, ENABLE, and DISABLE cause bridge initialization. Power Ups, Unsolicited Resets, and Management Resets are all mutually exclusive.
New Forwarding Database Entries Lost	The number of learned addresses that the bridge could not enter in its forwarding database because there was no space in volatile memory. This counter applies only to addresses learned by the bridge, not to those entered with the DECelms command ADD ADDRESS.
Device Frames Lost	The number of frames addressed to the bridge itself (such as DECelms commands and Hello messages) that the bridge discarded. The bridge discarded these frames because it did not have internal receive buffers available to hold them. This field applies only to the LAN Bridge 100; the equivalent information is in the Line Counters display for the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

Table 5–14 (Cont.): Bridge Counters Display Fields

Display Field	Description
Upline Dump Failed	The number of times that the bridge failed to up-line dump its memory image and register counters after a fatal error. The bridge attempts an up-line dump only if its Up-Line Dump software switch is set to True, as described in Section 2.4.2. The dump may have failed because there was no suitably configured host available to accept the dump. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Upline Dump Success	The number of times that the bridge successfully up-line dumped its memory image and register counters after a fatal error. The bridge attempts an up-line dump only if its Up-Line Dump software switch is set to True, as described in Section 2.4.2. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Loaded Tasks	The number of down-line loaded tasks running on the bridge. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Spanning Tree Mode Changes	The number of times that the bridge switched between the 802 Spanning Tree Mode and the LAN Bridge 100 Spanning Tree Mode. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Unsolicited Resets	The number of times that the bridge initialized itself after encountering a fatal error. Power Ups, Management Resets, and Unsolicited Resets are all mutually exclusive. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Invalid Passwords	The number of DECelms commands with invalid or missing passwords that the bridge received. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, the INITIALIZE, SET, ENABLE, DISABLE, ADD, and REMOVE commands must be entered with the bridge's password. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

5.4.1.2 Wiring Concentrator Counters Display

This section describes the SHOW COUNTERS display for a wiring concentrator. Table 5–15 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target wiring concentrator. An example of the SHOW COUNTERS display for a wiring concentrator follows.

```
Show Device Counters                     As of: 27-APR-1990 11:21:34
Name: NORTHSTATION                        Address: 08-00-2B-21-43-31

Seconds Operating:                          173445
Power Ups:                                  2
Management Resets:                          2
Upline Dump Failed:                         1
Upline Dump Success:                        2
Unsolicited Resets:                         1
Invalid Passwords:                          0
```

Table 5–15: Wiring Concentrator Counters Display Fields

Display Field	Description
Seconds Operating	The number of seconds since the wiring concentrator was powered on.
Power Ups	The number of times that the wiring concentrator was powered on. Power Ups, Management Resets, and Unsolicited Resets are all mutually exclusive.
Management Resets	The number of times that the wiring concentrator was initialized by a DECelms command. The DECelms command INITIALIZE causes wiring concentrator initialization. Power Ups, Unsolicited Resets, and Management Resets are all mutually exclusive.
Upline Dump Failed	The number of times that the wiring concentrator failed to up-line dump its memory image and register counters after a fatal error. The wiring concentrator attempts an up-line dump only if its Up-Line Dump software switch is set to True, as described in Section 2.4.2. The dump may have failed because there was no suitably configured host available to accept the dump.

Table 5–15 (Cont.): Wiring Concentrator Counters Display Fields

Display Field	Description
Upline Dump Success	The number of times that the wiring concentrator successfully up-line dumped its memory image and register counters after a fatal error. The wiring concentrator attempts an up-line dump only if its Up-Line Dump software switch is set to True, as described in Section 2.4.2.
Unsolicited Resets	The number of times that the wiring concentrator initialized itself after encountering a fatal error. Power Ups, Management Resets, and Unsolicited Resets are all mutually exclusive.
Invalid Passwords	The number of DECelms commands with invalid or missing passwords that the wiring concentrator received. If the target wiring concentrator has a password set, the INITIALIZE, SET, ENABLE, and DISABLE commands must be entered with the wiring concentrator's password.

5.4.2 Displaying Line Counters

When a bridge line or wiring concentrator line is the command domain, the SHOW COUNTERS command displays the counters that are specific to the line. These counters measure line operational events and errors. They are reset to zero when the bridge is initialized. For a description of the SHOW COUNTERS display for a line, see the following sections:

- Bridge Ethernet/IEEE 802.3 line—Section 5.4.2.1
- Bridge FDDI line—Section 5.4.2.2
- Wiring concentrator line—Section 5.4.2.3

The optional phrase EVERY *nn* SECONDS (or EVERY *nn* MINUTES) causes DECelms to update the display at the specified interval. To terminate the display, press Return. The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

NOTE

If you include the EVERY phrase when the domain is KNOWN LINES, you must send the output to a file.

To display the counters of a specific line, enter LINE and the line number. The following command displays the counters of line 1 on the bridge MYSTICRIVER and instructs DECelms to update the display every 30 seconds:

```
ELMS> SHOW MYSTICRIVER LINE 1 COUNTERS EVERY 30 SECONDS
```

On the DECconcentrator 500, there is only one line, line 1. The following commands display the counters of the line on the wiring concentrator GRANDCENTRAL:

```
ELMS> USE GRANDCENTRAL LINE 1
ELMS> SHOW COUNTERS
```

To display the counters of both lines on a bridge, make KNOWN LINES the command domain. The following commands send the counter values of both lines on the bridge BROOKLYN to the file BROOKLYN.COUNTERS:

```
ELMS> USE BROOKLYN
ELMS> SHOW KNOWN LINES COUNTERS TO BROOKLYN.COUNTERS
```

5.4.2.1 Bridge Ethernet/IEEE 802.3 Line Counters Display

This section describes the SHOW COUNTERS display for an Ethernet/IEEE 802.3 line on a bridge. It applies to all models of bridges. Table 5–16 describes the fields of this display. The display header shows the current date and time, along with the name and address of the bridge that contains the line being monitored. N/A appears in a display field if the field does not apply to the model of bridge being monitored. Press the down arrow key (⇩) or the next screen key (Next Screen) to scroll through the entire display. An example of the SHOW COUNTERS display for a LAN Bridge 200 Ethernet/IEEE 802.3 line follows.

```
Line Counters for Line 1                   As of: 27-APR-1990 11:21:16
Name: LONDON                                Address    08-00-2B-0C-1A-A7
```

Seconds Operating:	2287429
Forwarding State Entered:	1
Port Restarts:	2
Unknown Destination Addresses Received:	1681
Frames Filtered:	109834
Multicast Frames Filtered:	32023
Frames Address Filtered:	243455
Frames Protocol Filtered:	23454
Total Frames Sent:	38594594
Total Frames Received:	24352925
Total Bytes Sent:	23489222454
Total Bytes Received:	42545445151
Device Frames Sent:	589
Device Frames Received:	595
Device Bytes Sent:	97238
Device Bytes Received:	349025
Device Frames Lost:	0
Multicast Frames Sent:	34859
Multicast Frames Received:	34554
Multicast Bytes Sent:	8495872
Multicast Bytes Received:	8347441
Multicast Device Frames Sent:	84759
Multicast Device Frames Received:	84724
Multicast Device Bytes Sent:	198394
Multicast Device Bytes Received:	178439
Invalid Device Messages Count:	0
Bad Frames Received:	0
Bad Bytes Received:	0
Transmitted Frames Lost:	0
System Buffer Unavailable:	0
Bad Hello Limit Exceeded:	0
Collision Test Failed:	0
Transmit Frames Error:	0
Multicast Source Frames Received:	0
Lifetime Exceeded Frames:	0
Lifetime Exceeded Bytes:	0
Transmit Bytes Error:	0
Invalid Device Bytes:	0
Receive Overrun:	0
Oversize Frames:	12
Framing Error:	0
Transmit Multiple Collision:	0
Carrier Loss:	0
Collision Limit Exceeded:	0

Table 5–16: Bridge Ethernet/IEEE 802.3 Line Counters Display Fields

Display Field	Description
Seconds Operating	The number of seconds since the bridge was powered on.
Forwarding State Entered	The number of times that the line entered the FORWARDING state.
Port Restarts	The number of times that the bridge restarted the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Unknown Destination Addresses Received	The number of frames received on this line for which the bridge had no address entry in its forwarding database. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Frames Filtered	The number of frames successfully received on the line that were discarded by the bridge. The filtered frames were either addressed to a station on the same side of the bridge as the line or subject to filtering because of an entry in the bridge's forwarding database. If the bridge is a LAN Bridge 200, the frames may have been filtered because the bridge's Manual Filter software switch is set to True and there are no management entries with the disposition FORWARD for the frames' source **and** destination addresses.
Multicast Frames Filtered	The number of frames with multicast destination addresses that were received on the line but were discarded by the bridge. These frames were discarded because their addresses were entered in the forwarding database (by DECelms commands) with the disposition FILTER. If it is a LAN Bridge 200, the bridge may have filtered the frames because its Manual Filter software switch is set to True and there are no management entries with the disposition FORWARD for the source **and** destination addresses of the frames. This field applies only to the LAN Bridge 200 and the DECbridge 500.

Table 5–16 (Cont.): Bridge Ethernet/IEEE 802.3 Line Counters Display Fields

Display Field	Description
Frames Address Filtered	The number of frames received on this line that the bridge discarded because of address entries with the disposition FILTER in the bridge's forwarding database. If it is a LAN Bridge 200, the bridge may have filtered the frames because its Manual Filter software switch is set to True and there are no management entries with the disposition FORWARD for the frames' source **and** destination addresses. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Frames Protocol Filtered	The number of frames received on this line that the bridge discarded because of protocol entries with the disposition FILTER in the bridge's protocol database. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Total Frames Sent	The number of frames successfully transmitted on the line.
Total Frames Received	The number of frames successfully received on the line.
Total Bytes Sent	The number of bytes in the frames successfully transmitted on the line. This field applies only to the LAN Bridge 200.
Total Bytes Received	The number of bytes in the frames successfully received on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Device Frames Sent	The number of frames originating from the bridge that were transmitted on the line. This includes frames for bridge management, loopback, system identification, and spanning tree computation Hello messages. This field applies only to the LAN Bridge 100, LAN Bridge 200, and DECbridge 500 models.
Device Frames Received	The number of frames addressed to the bridge itself that were received on the line. This includes frames for bridge management, loopback, and system identification messages, but does **not** include frames for invalid protocol messages.
Device Bytes Sent	The number of bytes in the frames originating from the bridge that were transmitted on the line.

Table 5–16 (Cont.): Bridge Ethernet/IEEE 802.3 Line Counters Display Fields

Display Field	Description
Device Bytes Received	The number of bytes in the frames addressed to the bridge itself that were received on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Device Frames Lost	The number of frames received on the line addressed to the bridge itself that were discarded by the bridge. The bridge discarded the frames because it did not have internal receive buffers available to hold them. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models; the equivalent information appears in the Bridge Counters display for the LAN Bridge 100.
Multicast Frames Sent	The number of frames with multicast destination addresses that were successfully transmitted on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Multicast Frames Received	The number of frames with multicast destination addresses that were successfully received on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Multicast Bytes Sent	The number of bytes in Multicast Frames Sent. This field applies only to the LAN Bridge 200.
Multicast Bytes Received	The number of bytes in Multicast Frames Received. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Multicast Device Frames Sent	The number of frames with multicast destination addresses transmitted by the bridge itself on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Multicast Device Frames Received	The number of frames with multicast destination addresses sent to the bridge itself that were received on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Multicast Device Bytes Sent	The number of bytes in Multicast Device Frames Sent. This field applies only to the LAN Bridge 200 and the DECbridge 500.

Table 5–16 (Cont.): Bridge Ethernet/IEEE 802.3 Line Counters Display Fields

Display Field	Description
Multicast Device Bytes Received	The number of bytes in Multicast Device Frames Received. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Invalid Device Messages Count	The number of frames received on the line for the bridge itself that had a Protocol Type value or Destination Service Access Point (DSAP) value that is not supported by the bridge.
Bad Frames Received	The number of frames received on the line that had a bad frame check sequence.
Bad Bytes Received	The number of bytes in the frames received on the line that had a bad frame check sequence. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Transmitted Frames Lost	The number of frames that the bridge discarded because it ran out of transmit buffers for the line.
System Buffer Unavailable	The number of frames that the bridge discarded because it ran out of receive buffers for the line.
Bad Hello Limit Exceeded	The number of times that the number of bad (faulty) Hello messages received on the line exceeded the Bad Hello Limit set for the bridge. This is a nonsettable line spanning tree parameter.
Collision Test Failed	The number of times that a Collision Presence Test (CPT) signal was not detected within 4 microseconds after a transmission on the line. This counter is valid only if CPT is set to Enabled for the line, as described in Section 3.2.
Transmit Frames Error	The number of frames that were transmitted with an error on the line. This field applies only to LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Multicast Source Frames Received	The number of frames received on the line that had a multicast source address. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Lifetime Exceeded Frames	The number of frames queued for transmission on the line that the bridge discarded because it held them longer than the maximum frame lifetime.

Table 5–16 (Cont.): Bridge Ethernet/IEEE 802.3 Line Counters Display Fields

Display Field	Description
Lifetime Exceeded Bytes	The number of bytes in Lifetime Exceeded Frames. This field applies only to the LAN Bridge 200.
Transmit Bytes Error	The number of bytes in the frames that were transmitted with an error on the line. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Invalid Device Bytes	The number of bytes in the frames received on the line for the bridge itself that had an invalid Protocol Type field or Destination Service Access Point (DSAP) value. This field applies only to the LAN Bridge 200 and the DECbridge 500.
Receive Overrun	The number of times that the bridge received a frame loss indication from the hardware on the line.
Oversize Frames	The number of frames received on the line that were larger than the maximum legal size. This field applies only to the LAN Bridge 200 and DECbridge 500.
Framing Error	The number of times that a frame received on the line contained both a noninteger multiple of 8 bits and a cyclic redundancy check (CRC) error. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Transmit Multiple Collision	The number of times that the bridge had to retry transmission of a frame more than once on the line. The retries were necessary because of collisions during transmission due to congestion on the physical medium. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Carrier Loss	The number of times that the bridge detected a loss of the carrier signal while transmitting a frame on the line. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.
Collision Limit Exceeded	The number of times that the bridge failed to transmit a frame on this line after 16 attempts, the collision limit. This field applies only to the LAN Bridge 150, LAN Bridge 200, and DECbridge 500 models.

5.4.2.2 Bridge FDDI Line Counters Display

This section describes the SHOW COUNTERS display for a DECbridge 500 FDDI line. (The FDDI line on a DECbridge 500 is always line 1.) Many of these counters measure FDDI MAC entity events. Table 5–17 describes the fields of this display. The display header shows the current date and time, along with the name and address of the bridge that contains the line being monitored. Press the down arrow key (⇓) or the next screen key (Next Screen) to scroll through the entire display. An example of the SHOW COUNTERS display for a DECbridge 500 FDDI line follows.

```
Line Counters for Line 1                    As of: 27-APR-1990 11:21:16
Name: HARVARD                                Address: 08-00-2B-0C-1A-A7

Seconds Operating:                                   63170
Forwarding State Entered:                            1
Port Restarts:                                       2
Unknown Destination Addresses Received:              1681
Frames Filtered:                                     109834
Multicast Frames Filtered:                           N/A
Frames Address Filtered:                             243455
Frames Protocol Filtered:                            23454
Total Frames Sent:                                   38594594
Total Frames Received:                               24352925
Total Bytes Sent:                                    N/A
Total Bytes Received:                                N/A
Device Frames Sent:                                  589
Device Frames Received:                              595
Device Bytes Sent:                                   97238
Device Bytes Received:                               349025
Device Frames Lost:                                  0
Multicast Frames Sent:                               34859
Multicast Frames Received:                           N/A
Multicast Bytes Sent:                                N/A
Multicast Bytes Received:                            N/A
Multicast Device Frames Sent:                        84759
Multicast Device Frames Received:                    84724
Multicast Device Bytes Sent:                         198394
Multicast Device Bytes Received:                     178439
Invalid Device Messages Count:                       0
Bad Frames Received:                                 0
Bad Bytes Received:                                  N/A
Transmitted Frames Lost:                             0
System Buffer Unavailable:                           0
Bad Hello Limit Exceeded:                            0
Transmit Frames Error:                               0
Multicast Source Frames Received:                    N/A
Lifetime Exceeded Frames:                            0
Lifetime Exceeded Bytes:                             N/A
Transmit Bytes Error:                                N/A
Invalid Device Bytes:                                0
```

```
Receive Overrun:                                  0
Oversize Frames:                                  12
Framing Error:                                    N/A
Length Error:                                     0
Frame Count:                                      2355245
Error Count:                                      0
Lost Count:                                       0
Ring Initialization Initiated:                    1
Ring Initialization Received:                     0
Ring Beaconing Initiated:                         0
Duplicate Address Test Failed:                    0
Duplicate Token Detected:                         0
Traces Initiated:                                 2
Traces Received:                                  2
Frame Status Error:                               0
Frame Alignment Error:                            0
Ring Purge Error:                                 0
Transmit Underruns:                               0
Unprocessed Error Packets:                        0
Bridge Strip Error:                               0
IP Datagrams Fragmented:                          0
IP Datagrams Discarded - Don't Fragment:          0
IP Datagrams Discarded - Illegal Header Length:   0
IP Datagrams Discarded - Illegal Size:            0
```

Table 5–17: Bridge FDDI Line Counters Display Fields

Display Field	Description
Seconds Operating	The number of seconds since the bridge was powered on.
Forwarding State Entered	The number of times that the line entered the FORWARDING state.
Port Restarts	The number of times that the bridge restarted the line.
Unknown Destination Addresses Received	The number of frames received on this line for which the bridge had no address entry in its forwarding database.
Frames Filtered	The number of frames successfully received on the line that were discarded by the bridge. The filtered frames were either addressed to a station on the same side of the bridge as the line or subject to filtering because of an entry in the bridge's forwarding database.

Table 5–17 (Cont.): Bridge FDDI Line Counters Display Fields

Display Field	Description
Multicast Frames Filtered	The number of frames with multicast destination addresses that were received on the line but were discarded by the bridge. These frames were discarded because their addresses were entered in the forwarding database (by DECelms commands) with the disposition FILTER. This field does not apply to the FDDI line on a DECbridge 500.
Frames Address Filtered	The number of frames received on this line that the bridge discarded because of address entries with the disposition FILTER in the bridge's forwarding database. If it is a LAN Bridge 200, the bridge may have filtered the frames because its Manual Filter software switch is set to True and there are no management entries with the disposition FORWARD for the frames' source **and** destination addresses.
Frames Protocol Filtered	The number of frames received on this line that the bridge discarded because of protocol entries with the disposition FILTER in the bridge's protocol database.
Total Frames Sent	The number of frames successfully transmitted on the line.
Total Frames Received	The number of frames successfully received on the line.
Total Bytes Sent	The number of bytes in the frames successfully transmitted on the line. This field does not apply to the FDDI line on a DECbridge 500.
Total Bytes Received	The number of bytes in the frames successfully received on the line. This field does not apply to the FDDI line on a DECbridge 500.
Device Frames Sent	The number of frames originating from the bridge that were transmitted on the line. This includes frames for bridge management, loopback, system identification, and spanning tree computation Hello messages.
Device Frames Received	The number of frames addressed to the bridge itself that were received on the line. This includes frames for bridge management, loopback, and system identification messages, but does **not** include frames for invalid protocol messages.

Table 5–17 (Cont.): Bridge FDDI Line Counters Display Fields

Display Field	Description
Device Bytes Sent	The number of bytes in the frames originating from the bridge that were transmitted on the line.
Device Bytes Received	The number of bytes in the frames addressed to the bridge itself that were received on the line.
Device Frames Lost	The number of frames received on the line addressed to the bridge itself that were discarded by the bridge. The bridge discarded the frames because it did not have internal receive buffers available to hold them.
Multicast Frames Sent	The number of frames with multicast destination addresses that were successfully transmitted on the line.
Multicast Frames Received	The number of frames with multicast destination addresses that were successfully received on the line. This field does not apply to the FDDI line on a DECbridge 500.
Multicast Bytes Sent	The number of bytes in Multicast Frames Sent. This field does not apply to the FDDI line on a DECbridge 500.
Multicast Bytes Received	The number of bytes in Multicast Frames Received. This field does not apply to FDDI lines on the DECbridge 500.
Multicast Device Frames Sent	The number of frames with multicast destination addresses transmitted by the bridge itself on the line.
Multicast Device Frames Received	The number of frames with multicast destination addresses sent to the bridge itself that were received on the line.
Multicast Device Bytes Sent	The number of bytes in Multicast Device Frames Sent.
Multicast Device Bytes Received	The number of bytes in Multicast Device Frames Received.
Invalid Device Messages	The number of frames received on the line for the bridge itself that had a Protocol Type value or Destination Service Access Point (DSAP) value that is not supported by the bridge.
Bad Frames Received	The number of frames received on the line that had a bad frame check sequence.

Table 5–17 (Cont.): Bridge FDDI Line Counters Display Fields

Display Field	Description
Bad Bytes Received	The number of bytes in the frames received on the line that had a bad frame check sequence. This field does not apply to FDDI lines on the DECbridge 500.
Transmitted Frames Lost	The number of frames that the bridge discarded because it ran out of transmit buffers for the line.
System Buffer Unavailable	The number of frames that the bridge discarded because it ran out of receive buffers for the line.
Bad Hello Limit Exceeded	The number of times that the Bad Hellos on the line exceeded the Bad Hello Limit set for the bridge. This is a nonsettable line spanning tree parameter.
Transmit Frames Error	The number of frames that were transmitted with an error on the line.
Multicast Source Frames Received	The number of frames received on the line that had a multicast source address. This field does not apply to FDDI lines on the DECbridge 500.
Lifetime Exceeded Frames	The number of frames queued for transmission on the line that the bridge discarded because it held them longer than the maximum frame lifetime.
Lifetime Exceeded Bytes	The number of bytes in Lifetime Exceeded Frames. This field does not apply to FDDI lines on the DECbridge 500.
Transmit Bytes Error	The number of bytes in the frames that were transmitted with an error on the line. This field does not apply to FDDI lines on the DECbridge 500.
Invalid Device Bytes	The number of bytes in the frames received on the line for the bridge itself that had an invalid Protocol Type field or Destination Service Access Point (DSAP) value.
Receive Overrun	The number of times that the bridge received a frame loss indication from the hardware on the line.
Oversize Frames	The number of frames received on the line that were larger than the maximum legal size.

Table 5–17 (Cont.): Bridge FDDI Line Counters Display Fields

Display Field	Description
Framing Error	The number of times that a frame received on the line contained both a noninteger multiple of 8 bits and a cyclic redundancy check (CRC) error. This field does not apply to the FDDI lines on a DECbridge 500.
Length Error	The number of frames received on the line that had an invalid length, either too long or too short.
Frame Count	The total number of frames received on the line, including those frames that the bridge stripped from the ring and those that it merely repeated. This total includes MAC (Media Access Control) frames other than tokens, SMT (Station Management) frames, LLC (Logical Link Control) frames, and other FDDI frames.
Error Count	The number of error frames detected by the line; that is, the number of times that the line MAC entity changed the E (error detected) field in a frame from R to S. This total does not include error frames that were previously detected by other stations on the ring.
Lost Count	The number of times that the line detected a frame (other than a token) that was improperly terminated. When the line detects an improperly terminated frame, it strips the rest of the frame from the ring and replaces it with Idle symbols.
Ring Initialization Initiated	The number of times that the FDDI MAC entity initiated the claim token process.
Ring Initialization Received	The number of times that other stations initialized the ring, either by the claim token process or by the ring beacon process.
Ring Beaconing Initiated	The number of times that the FDDI MAC entity initiated the ring beacon process. The bridge initiates the ring beacon process when it detects a claim token process failure or a break in the ring.
Duplicate Address Test Failed	The number of times that the FDDI MAC entity detected a duplicate of its own line address on the ring.

Table 5–17 (Cont.): Bridge FDDI Line Counters Display Fields

Display Field	Description
Duplicate Token Detected	The number of times that the FDDI MAC entity detected a duplicate token on the ring, either by the duplicate token detected algorithm or by receiving a token while holding a token.
Traces Initiated	The number of times that the FDDI MAC entity initiated the PC trace process. The FDDI MAC entity initiates the PC trace process in the event of a stuck beacon, the situation where the ring beacon process is unable to localize a fault to a single link in the network. (A station is stuck beaconing when its FDDI MAC entity has been beaconing longer than the time defined by the ANSI FDDI parameter T_Stuck.)
Traces Received	The number of times the FDDI MAC entity propagated a PC trace process because it received a PC trace event.
Frame Status Error	The number of frames received on the line that had the E (error detected) indicator set or a missing E indicator.
Frame Alignment Error	The number of frames received on the line that contained an odd number of symbols; that is, a non-integral number of octets.
Ring Purge Error	The number of times that the ring purger received a token while still in the ring purge state.
Transmit Underruns	An underrun occurred because the bridge's transmit FIFO became empty due to insufficient memory. In other words, the bridge was trying to transmit but could not get into packet memory fast enough.
Unprocessed Error Packets	The number of times that the bridge received a frame that contained an error but did not have time to decipher it.
Bridge Strip Error	The number of times the bridge terminated a bridge strip operation because it received a token.
IP Datagrams Fragmented	The number of large Internet Protocol (IP) frames received on the line that the bridge fragmented into smaller frames for transmission on its Ethernet/IEEE 802.3 line. The fragmentation is necessary because the maximum data size for a frame on an FDDI ring is 4500 octets, but only 1518 octets for a frame on an Ethernet/IEEE 802.3 segment.

Table 5–17 (Cont.): Bridge FDDI Line Counters Display Fields

Display Field	Description
IP Datagrams Discarded - Don't Fragment	The number of oversized Internet Protocol (IP) frames received on the FDDI line that the bridge discarded because they were too large to be transmitted on the Ethernet/IEEE 802.3 line. The bridge discards oversized IP frames when its Fragmentation software switch is set to Disabled, as described in Section 2.7.
IP Datagrams Discarded - Illegal Header Length	The number of oversized Internet Protocol (IP) frames received on the line that the bridge discarded because of illegal header length.
IP Datagrams Discarded - Illegal Size	The number of oversized Internet Protocol (IP) frames received on the line that the bridge discarded because of illegal size. A frame has an illegal size when its Total Length field contains a value that is greater than the size of the frame reduced by the size of the LLC and MAC trailers and headers.

5.4.2.3 Wiring Concentrator Line Counters Display

This section describes the SHOW COUNTERS display for the line on a wiring concentrator. (The line on a wiring concentrator is always line 1.) Many of these counters measure FDDI MAC entity events. Table 5–15 describes the fields of this display. The display header shows the current date and time, along with the name and address of the wiring concentrator that contains the line being monitored. Press the down arrow key (⇓) or the next screen key (Next Screen) to scroll through the entire display. An example of the SHOW COUNTERS display for a DECconcentrator 500 line follows.

```
Line Counters for Line 1              As of: 27-APR-1990 11:21:16
Name: NORTHSTATION                     Address: 08-00-2B-0C-1A-A7
```

```
Seconds Operating:                       63170
Total Frames Sent:                       38594594
Total Frames Received:                   24352925
Total Bytes Sent:                        476590
Total Bytes Received:                    345680
Invalid Device Messages:                 0
Bad Frames Received:                     0
Transmit Error Frames:                   0
Receive Overrun:                         0
System Buffer Unavailable:               0
Oversize Frames:                         12
Frame Count:                             2355245
Error Count:                             0
Lost Count:                              0
Ring Initialization Initiated:           23
Ring Initialization Received:            23
Ring Beaconing Initiated:                32
Duplicate Address Test Failed:            0
Duplicate Token Detected:                 0
Traces Initiated:                         2
Traces Received:                          2
Frame Status Error:                       0
Frame Alignment Error:                    0
Ring Purge Error:                         0
Transmit Underruns:                       0
```

Table 5–18: Wiring Concentrator Line Counters Display Fields

Display Field	Description
Seconds Operating	The number of seconds since the wiring concentrator was powered on.
Total Frames Sent	The number of frames successfully transmitted on the line.
Total Frames Received	The number of frames successfully received on the line.
Total Bytes Sent	The number of bytes in the frames successfully transmitted on the line.
Total Bytes Received	The number of bytes in the frames successfully received on the line.
Invalid Device Messages	The number of frames received on the line for the wiring concentrator itself that had a Protocol Type value or Destination Service Access Point (DSAP) value that is not supported by the wiring concentrator.

Table 5–18 (Cont.): Wiring Concentrator Line Counters Display Fields

Display Field	Description
Bad Frames Received	The number of frames received on the line that had a bad frame check sequence.
Transmit Error Frames	The number of frames that the line detected as being transmitted with errors.
Receive Overrun	The number of times that the wiring concentrator received a frame loss indication from the hardware on the line.
System Buffer Unavailable	The number of frames that the wiring concentrator discarded because it ran out of receive buffers for the line.
Oversize Frames	The number of frames received on the line that were larger than the maximum legal size.
Frame Count	The total number of frames received on the line, including those frames that the wiring concentrator stripped from the ring and those that it merely repeated. This total includes MAC (Media Access Control) frames other than tokens, SMT (Station Management) frames, LLC (Logical Link Control) frames, and other FDDI frames.
Error Count	The number of error frames detected by the line; that is, the number of times that the FDDI MAC entity changed the E (error detected) field in a frame from R to S. This total does not include error frames that were previously detected by other stations on the ring.
Lost Count	The number of times that the line detected a frame (other than a token) that was improperly terminated. When the line detects an improperly terminated frame, it strips the rest of the frame from the ring and replaces it with Idle symbols.
Ring Initialization Initiated	The number of times that the FDDI MAC entity initiated the claim token process.
Ring Initialization Received	The number of times that other stations initialized the ring, either by the claim token process or by the ring beacon process.

Table 5–18 (Cont.): Wiring Concentrator Line Counters Display Fields

Display Field	Description
Ring Beaconing Initiated	The number of times that the FDDI MAC entity initiated the ring beacon process. The wiring concentrator initiates the ring beacon process when it detects a claim token process failure or a break in the ring.
Duplicate Address Test Failed	The number of times that the FDDI MAC entity detected a duplicate of its own address on the ring.
Duplicate Token Detected	The number of times that the FDDI MAC entity detected a duplicate token on the ring, either by the duplicate token detected algorithm or by receiving a token while holding a token.
Traces Initiated	The number of times that the FDDI MAC entity initiated the PC trace process. The FDDI MAC entity initiates the PC trace process in the event of a stuck beacon, the situation where the ring beacon process is unable to localize a fault to a single link in the network. (A station is stuck beaconing when its FDDI MAC entity has been beaconing longer than the time defined by the ANSI FDDI parameter T_Stuck.)
Traces Received	The number of times the FDDI MAC entity propogated a PC trace process because it received a PC trace event.
Frame Status Error	The number of frames received on the line that had the E (error detected) indicator set or a missing E indicator.
Frame Alignment Error	The number of frames received on the line that contained an odd number of symbols; that is, a non-integral number of octets.
Ring Purge Error	The number of times that the ring purger received a token while still in the ring purge state.
Transmit Underruns	An underrun occurred because the wiring concentrator's transmit FIFO became empty due to insufficient memory. In other words, the wiring concentrator was trying to transmit but could not get into packet memory fast enough.

5.4.3 Displaying Physical Port Counters

When a physical port (PHY entity) on a DECbridge 500 or DECconcentrator 500 is the command domain, the SHOW COUNTERS command displays the counters that are specific to the physical port. These counters measure physical port operational events and errors. They are reset to zero when the device is initialized.

The optional phrase EVERY *nn* SECONDS (or EVERY *nn* MINUTES) instructs DECelms to update the display at the specified interval. To terminate the display, press [Return].

The optional phrase TO *file-spec* sends the information to the specified file rather than displaying it on your screen. (You can specify the directory and file name, but not the node name or the device name.)

To display the counters of a specific physical port, enter PHYPORT and the physical port number. The following command displays the counters of physical port 1C on the wiring concentrator NORTHSTATION:

```
ELMS> SHOW NORTHSTATION PHYPORT 1C STATUS
```

On a DECbridge 500, the physical port is always number 1. The following commands display the counters of the physical port on the DECbridge 500 named JAMESRIVER and instruct DECelms to update the display every every 2 minutes.

```
ELMS> USE JAMESRIVER PHYPORT 1
ELMS> SHOW COUNTERS EVERY 2 MINUTES
```

To display the counters of all the physical ports on a DECconcentrator 500, make KNOWN PHYPORTS the command domain. The following commands send the counters of all the physical ports on the wiring concentrator NORTHSTATION to the file NORTHSTATION.COUNT:

```
ELMS> USE NORTHSTATION KNOWN PHYPORTS
ELMS> SHOW COUNTERS TO NORTHSTATION.COUNT
```

Table 5–19 describes the fields of the SHOW COUNTERS display for a physical port on DECbridge 500 or DECconcentrator 500. The header of this display shows the current date and time, along with the name, address, and line number of the target bridge or wiring concentrator. An example of the SHOW COUNTERS display for the physical port on a DECbridge 500 FDDI line follows:

```
Phy Port Counters for Port 1                  As of: 27-APR-1990 11:22:06
Name: VAUXHALL                                  Address: 08-00-2B-0C-1A-A7

Seconds Operating:                 823898
LEM Rejects:                       0
LEM Link Errors:                   0
LCT Rejects:                       0
Connections Completed:             1
Elasticity Buffer Errors:          0
TNE Expired Rejects:               0
```

Table 5–19: Physical Port Counters Display Fields

Display Field	Description
Seconds Operating	The number of seconds since the bridge or wiring concentrator was powered on or initialized. Power up and initialization resets the counters.
LEM Rejects	The number of times that this physical port disconnected an active connection because the link error monitor (LEM) threshold was exceeded. The DECelms command SET LEM THRESHOLD sets the LEM threshold for a physical port, as described in Section 3.8.
LEM Link Errors	The number of noise events detected by the Link Error Monitor (LEM).
LCT Rejects	The number of times that the physical port rejected a connection because of a failure of the Link Confidence Test (LCT).
Connections Completed	The number of times the physical port completed a connection, having completed the initialization process.
Elasticity Buffer Errors	The number of times that the elasticity buffer function in the physical port had an overflow or underflow, indicating a transmit clock error somewhere in the network.
TNE Expired Rejects	The number of times that the physical port terminated a connection because the TNE noise timer expired, indicating that a single noise event lasted for more than 1.31072 milliseconds.

5.5 Displaying SMT Information

This section explains how to display Status Information Frame (SIF) configuration and operation information for any station that complies with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1, regardless of the manufacturer of the station. It also describes how to display a map of the FDDI ring.

5.5.1 Displaying SIF Configuration Information

The SHOW SIF CONFIGURATION command displays the configuration of any station that complies with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1, regardless of the manufacturer of the station. The display shows the station type, station configuration and connection policies, the internal configuration of the PHY and MAC entities, and other configuration information.

You must include the name or 48-bit address of the target station. You cannot use a name for the target station unless it is registered in the DECelms registry.

You must also include VIA *concentrator-id*, where *concentrator-id* is the name or 48-bit address of any DECconcentrator 500. The DECconcentrator 500 serves as an SMT agent for your request. It responds to the SHOW SIF CONFIGURATION command by sending an SMT Status Information Frame (SIF) Configuration Request to the target station. The DECconcentrator 500 then interprets the station's SIF Configuration Response or SIF Configuration Request Denied frame and sends the information to the DECelms system. DECelms displays the information on your screen.

To send the output to a file rather than displaying it on your screen, include the TO *file-spec* phrase. You can specify the file name but not the node name, device name, or directory. DECelms places the file in the current default directory.

The following command displays the configuration of the FDDI station with the address 07-00-2C-8A-9B-13, a workstation manufactured by another vendor. The wiring concentrator GRANDCENTRAL serves as the SMT agent, sending a SIF Configuration Request to the workstation and relaying the information back to DECelms.

```
ELMS> SHOW SIF CONFIGURATION 07-00-2C-8A-9B-13 VIA GRANDCENTRAL
```

The following command displays SMT SIF configuration information for the station BAYBRIDGE, a DECbridge 500 that is registered in the DECelms registry. The DECconcentrator 500 with the address 08-00-2B-87-A2-32 serves as the SMT agent for the request.

```
ELMS> SHOW SIF CONFIGURATION BAYBRIDGE VIA 08-00-2B-87-A2-32
```

The following command writes the SIF configuration information for the station with the address 06-00-4B-90-7E-34 to the file SIF.DAT. The DECconcentrator 500 named TERMINI serves as the SMT agent.

```
ELMS> SHOW SIF CONFIGURATION 06-00-4B-90-7E-34 VIA TERMINI TO SIF.DAT
```

An example of the SHOW SIF CONFIGURATION display for a successful response follows. Table 5–20 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target device. (DECelms does not display the name unless the device is registered in the DECelms registry.) The header also shows the name and address of the DECconcentrator 500 that served as the SMT agent for the request. Press the down arrow key (⇓) or the next screen key (Next Screen) to scroll through the entire display.

```
SIF Configuration Information                 As of: 27-APR-1990 11:21:15
Name:                                          Address: 07-00-4B-89-2A-31
Gateway Name: GRANDCENTRAL             Gateway Address: 08-00-2B-98-3A-97

Station ID:                         00-00-07-00-4B-89-2A-31
SMT Version ID:                     1
Station Timestamp:                  1296321.83740 ms
Station Type:                       SAS (Single Attachment Station)
Station Class:                      Station
Number of MACs:                     1
Number of Ring Attachments:         1
Number of Slave Ports:
Station State:                      Status Reports Supported
Active Slave Ports:
Station Configuration:
                                                 token flow:   ->
   ------------------------------------------------------------------------------
   ENTITY    CONNECTED_TO                     CONFIGURATION STATUS
   ------------------------------------------------------------------------------
   Ports:                        Type         Remote       Port           Remote
                                              type         state          MAC

   Port1   -> Portxx              S             M          Active           Y
   ______________________________________________________________________________
   MACs:                 Address           Upstream Addr       Downstream Addr

   Mac1   ->  Port1  07-00-4B-89-2A-31  08-00-2B-08-54-A1  08-00-2B-98-34-93
```

```
Station Configuration Policies:          Hold Capability Unavailable
Station Connection Policies:             Rejects: A-A, B-B
                                         Accepts: M-S
Path Latency Ring One:                   3.98321 ms
Path Latency Ring Two:                   2.18730 ms
SMT Supported Versions:                  1
```

Table 5–20: SIF Configuration Information Display Fields

Display Field	Description
Station ID	The 64-bit SMT station ID of the station. The station ID is 8 hex bytes in the form *nn-nn-nn-nn-nn-nn-nn-nn*. The first two bytes are implementation specific (zero in Digital's implementation); the last six bytes are the IEEE universally administered 48-bit address of the station.
SMT Version ID	The version number of the FDDI Station Management (SMT) protocol used on the station. Note that this is not the revision number of the SMT standard document.
Station Timestamp	The number of milliseconds since the station was powered up or initialized.

Table 5–20 (Cont.): SIF Configuration Information Display Fields

Display Field	Description
Station Type	The type of the station: SAS (Single Attachment Station) — A station that has a single connection to the FDDI ring through a wiring concentrator. DAS (Dual Attachment Station) — A station that is connected to both the primary and secondary rings of the FDDI dual ring. SAC (Single Attachment Concentrator) — A wiring concentrator that has a single connection to the FDDI dual ring through another wiring concentrator. DAC (Dual Attachment Concentrator) — A wiring concentrator that is connected to both the primary and secondary ring of the FDDI dual ring. NAC (No Attachment Concentrator) — A standalone wiring concentrator that is not connected to an FDDI dual ring, but instead provides FDDI communications for a group of single attachment or dual attachment stations. This is sometimes referred to as an unrooted configuration. Unrecognized — DECelms could not interpret the response from the device.
Station Class	The class of the station: Station — An addressable node capable of transmitting, repeating, and receiving information. A station has exactly one SMT and at least one MAC, one PHY, and one PMD. Concentrator — An FDDI node that has additional PHY and PMD entities to support the connection of stations and other wiring concentrators in a tree topology. Unrecognized — DECelms could not interpret the response from the device.
Number of MACs	The number of MAC (Media Access Control) entities in the station.

Table 5–20 (Cont.): SIF Configuration Information Display Fields

Display Field	Description
Number of Ring Attachments	The number of attachments from the station to the FDDI dual ring. This field applies only to stations that have the Unrecognized value in the Station Type field of this display.
Number of Slave Ports	The number of S (slave) type physical ports supported by this wiring concentrator. Each S type physical port is on a station that is connected to the ring through this wiring concentrator. This field applies only to wiring concentrators.
Station State	The operational state of the station: Through — Both the primary and secondary rings pass through the station to the neighbor stations on each side. This value applies only to dual access stations (DAS) and dual access concentrators (DAC). Wrapped — The station has restored ring continuity after the failure of a neighbor station by connecting the primary ring to the secondary ring internally. This value applies only to dual access stations (DAS) and dual access concentrators (DAC).

Table 5–20 (Cont.): SIF Configuration Information Display Fields

Display Field	Description
	Attached in Tree — The station is connected to the FDDI dual ring through one or more wiring concentrators in a tree topology. This value applies only to wiring concentrators and dual access stations (DAS).
	Attached to Trunk — The station is directly connected to both the primary and secondary ring. This value applies only to dual access stations (DAS).
	Root Concentrator — The station is a wiring concentrator that is directly connected to both the primary and secondary ring.
	Twisted Ring A-A Connection — The station's A port is connected to the A port of another station. This results in a twisted ring, because the outgoing secondary ring connection of the station is connected to the incoming primary ring connection of the other station. This value applies only to dual access stations (DAS) and dual access concentrators (DAC).
	Twisted Ring B-B Connection — The station's B port is connected to the B port of another station. This results in a twisted ring, because the incoming secondary ring connection of the station is connected to the outgoing primary ring connection of the other station. This value applies only to dual access stations (DAS) and dual access concentrators (DAC).
	Status Reports Supported — The station supports the generation of SIF Configuration Response and SIF Operation Response frames, which are optional features of the SMT standard.

Table 5–20 (Cont.): SIF Configuration Information Display Fields

Display Field	Description
	Status Reports Unsupported — The station does not support the generation of SIF Configuration Response and SIF Operation Response frames, which are optional features of the SMT standard. Duplicate Address Detected — The station has detected a duplicate of its own address. Upstream Neighbor has Duplicate Address — The station's upstream neighbor has detected a duplicate of its own address. Unrecognized Flags Present: Topology = *N'nn'* Unrecognized Flags Present: Duplicate Address = *N'nn'* The message returned from the station contains other flags that are not defined in the SMT standard or that DECelms cannot interpret. DECelms displays the hex value of the unrecognized topology or duplicate address flag.
Active Slave Ports	A list of the active S ports supported by M ports on the station. This field applies only to wiring concentrators.
Station Configuration	This field displays the internal configuration of the station, showing the internal order of token flow. The top part of the table describes the PHY entities (physical ports) of the station; the bottom part shows the MAC entities. Ports — The SMT resource ID of each PHY in the station, along with the PHY or MAC to which it is connected. Type — The type of the PHY: A, B, M, or S. Remote type — The type of the PHY to which this PHY is connected: A, B, M, or S.

Table 5–20 (Cont.): SIF Configuration Information Display Fields

Display Field	Description
	Port state — The operational state of the PHY: — Active: The PHY has a connection established and is fully operational. — Disabled: The PHY was disabled by a managment directive. — Connecting: The PHY is in the process of establishing a connection. — Standby: The PHY is tested and ready to establish a physical connection, but disabled by the local station management. The reason may be a violation a topology rules, but PHYs are most often put on standby to provide redundancy in case of failure. Digital's implementation does not provide the standby feature. The following fields describe the configuration of each MAC on the station: Remote MAC — Indicates whether the PHY on the remote side of the connection is directly connected a MAC. MACs — The SMT resource ID of each MAC in the station, along with the PHY to which it is connected. Address — The 48-bit address of the MAC. Upstream Addr — The 48-bit address of the MAC's upstream neighbor. Downstream Addr — The 48-bit address of the MAC's downstream neighbor.
Station Configuration Policies	Indicates whether the station has the hold capability. The hold capability instructs the station not to wrap its primary ring onto its secondary ring in the event of an upstream or downstream break. This ensures that the remaining ring remains intact for its full circumference. When the hold capability is used, the primary and secondary fibers are usually housed in separate cable assemblies.

Table 5–20 (Cont.): SIF Configuration Information Display Fields

Display Field	Description
Station Connection Policies	Lists the types of connections that the station accepts and the types of connections that it rejects. The possibilities are: A-A, B-B, S-S, A-M, B-M, A-S, and B-S.
Path Latency Ring One	The time, in milliseconds, that it takes for a symbol pair to pass through the station on the primary ring.
Path Latency Ring Two	The time, in milliseconds, that it takes for a symbol pair to pass through the station on the secondary ring.
SMT Supported Versions	The version numbers of the FDDI Station Management (SMT) protocol supported by the station.

An example of the SHOW SIF CONFIGURATION display for a Request Denied response follows. Table 5–21 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target device. (DECelms does not display the name unless the device is registered in the DECelms registry.) The header also shows the name and address of the DECconcentrator 500 that served as the SMT agent for the request.

```
SIF Configuration Information                  As of: 27-APR-1990 11:21:15
Name:                                            Address: 07-00-4B-89-2A-31
Gateway Name: GRANDCENTRAL               Gateway address: 08-00-2B-98-3A-97

Rejected Request Class:                   SIF Configuration Request
Request Rejected Reason:                  Unsupported Frame Class
Station ID:                               00-00-07-00-4B-89-2A-31
SMT Version ID:                           1
SMT Supported Versions:                   1
```

Table 5–21: SIF Configuration Information Request Denied Display Fields

Display Field	Description
Rejected Request Class	The type of SMT request that caused the Request Denied response.

Table 5–21 (Cont.): SIF Configuration Information Request Denied Display Fields

Display Field	Description
Request Rejected Reason	The reason that the SIF Configuration Request was unsuccessful: Target Address Not Reachable — The DECconcentrator 500 that is serving as the SMT agent cannot communicate with the target station. Unsupported SMT Version — The target station does not comply with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1. Unsupported Frame Class — The target station does not support SIF Configuration Information frames. Target Cannot Parse the Request — The target station cannot currently process the SIF Configuration Request sent by the SMT agent.
Station ID	The 64-bit SMT station ID of the station. The station ID is 8 hex bytes in the form *nn-nn-nn-nn-nn-nn-nn-nn*. The first two bytes are implementation specific (zero in Digital's implementation); the last six bytes are the IEEE universally administered 48-bit address of the station.
SMT Version ID	The version number of the FDDI Station Management (SMT) protocol used on the station. Note that this is not the revision number of the SMT standard document.
SMT Supported Versions	The version numbers of the FDDI Station Management (SMT) protocol supported by the station.

5.5.2 Displaying SIF Operation Information

The SHOW SIF OPERATION command displays the status, characteristics, and counters of any station that complies with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1, regardless of the manufacturer of the station. The display shows information about each MAC entity and physical port (PHY entity) on the station.

You must include the name or 48-bit address of the target station. You cannot use a name for the target station unless it is registered in the DECelms registry.

You must also include VIA *concentrator-id*, where *concentrator-id* is the name or 48-bit address of any DECconcentrator 500. The DECconcentrator 500 serves as an SMT agent for your request. It responds to the SHOW SIF OPERATION command by sending an SMT Status Information Frame (SIF) Operation Request to the target station. The DECconcentrator 500 then interprets the station's SIF Operation Response or SIF Operation Request Denied frame and sends the information to the DECelms system. DECelms displays the information on your screen.

To send the output to a file rather than displaying it on your screen, include the TO *file-spec* phrase. You can specify the file name but not the node name, device name, or directory. DECelms places the file in the current default directory.

The following command displays the status, characteristics, and counters of the FDDI station with the address 07-00-2C-8A-9B-13, a workstation manufactured by another vendor. The wiring concentrator NORTHSTATION serves as the SMT agent, sending a SIF Operation Request to the workstation and relaying the information back to DECelms.

```
ELMS> SHOW SIF OPERATION 07-00-2C-8A-9B-13 VIA NORTHSTATION
```

The following command displays SMT SIF Operation information for the station GEORGEWASHINGTON, a DECbridge 500 that is registered in the DECelms registry. The DECconcentrator 500 with the address 08-00-2B-87-A2-32 serves as the SMT agent for the request.

```
ELMS> SHOW SIF OPERATION GEORGEWASHINGTON VIA 08-00-2B-87-A2-32
```

The following command writes the SIF Operation information for the station with the address 06-00-4B-90-7E-34 to the file SIF.DAT. The DECconcentrator 500 named TERMINI serves as the SMT agent.

```
ELMS> SHOW SIF OPERATION 06-00-4B-90-7E-34 VIA TERMINI TO SIF.DAT
```

An example of the SHOW SIF OPERATION display for a successful response follows. Table 5–22 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target device. (DECelms does not display the name unless the device is registered in the DECelms registry.) The header also shows the name and address of the DECconcentrator 500 that served as the SMT agent for the request. Press the down arrow key (⇓) or the next screen key (Next Screen) to scroll through the entire display.

SIF Operation Information
Name:
Gateway Name: GRANDCENTRAL

As of: 27-APR-1990 11:21:15
Address: 07-00-4B-89-2A-31
Gateway address: 08-00-2B-98-3A-97

Station ID: 00-00-07-00-4B-89-2A-31
SMT Version ID: 1
Station Timestamp: 148219389.90874 ms
Physical Port Status/Counters:

Ler = Link Error Rate
Lem = Link Error Monitor
Ebuf = Elasticity Buffer

Port	LER	LER_Cutoff Threshold	Ler_Alarm Threshold	LemErrors	LEMRejects	Ebuf Errors
Port1	8	7	6	4532	2	7
Port2	9	7	6	223	1	9
Port3	9	7	6	436	3	11
Port4	9	7	6	238	2	7

MAC Status/Characteristics/Counters:

Timer units: ms
TRT = 'Token Rotation Timer'
TVX = 'Valid Transmission Timer'

	MAC1
Negotiated TRT	8.0000 ms
Requested TRT	8.0000 ms
TVX	2.6214 ms
Maximum TRT	173.0150 ms
Minimum TRT	4.000 ms
Frame Count	2355245
Error Count	0
Lost Count	0
Frames Received	24352925
Frames Xmitted	38594594
Frames NotCopied	3456
T_Priority 0	3.0000 ms
T_Priority 1 ms	4.0000 ms
T_Priority 2 ms	5.0000 ms
Sync Bandwidth Allocation:	2.0000 ms

Manufacturer's OUI: 07-00-4B
Manufacturer's Data:
User Data:

Table 5–22: SIF Operation Information Display Fields

Display Field	Description
Station ID	The 64-bit SMT station ID of the station. The station ID is 8 hex bytes in the form *nn-nn-nn-nn-nn-nn-nn-nn*. The first two bytes are implementation specific (zero in Digital's implementation); the last six bytes are the IEEE universally administered 48-bit address of the station.
SMT Version ID	The version number of the FDDI Station Management (SMT) protocol used on the station. Note that this is not the revision number of the SMT standard document.
Station Timestamp	The number of milliseconds since the station was powered up or initialized.
Physical Port Status /Counters	This table shows the status and counter values of each PHY (physical port) on the station. Port — The SMT resource ID of the PHY. LER — The link error rate (LER) on the PHY, expressed as the absolute value of the exponent of the error rate. For example, the value 9 indicates that the link error rate is 10 to the negative ninth errors per second. LER Cutoff Threshold — The link error rate (LER) at which the station will shut down the PHY, expressed as the absolute value of the exponent of the error rate. For example, the value 7 indicates that the LER cutoff threshold is 10 to the negative seventh errors per second.

Table 5–22 (Cont.): SIF Operation Information Display Fields

Display Field	Description
	LER Alarm Threshold — The link rate (LER) on the PHY that will trigger an alarm, expressed as the absolute value of the exponent of the error rate. For example, the value 6 indicates that the LER alarm threshold is 10 to the negative sixth errors per second.
	LEM Errors — The total number of errors on the PHY detected by the link error monitor (LEM) since the station was powered up or initialized.
	LEM Rejects — The number of times that the link error monitor (LEM) disabled the PHY because the link error rate exceeded the threshold. This field shows the number of LEM rejects since the station was powered up or initialized.
	Ebuf Errors — The number of elasticity buffer errors on the PHY since the station was powered up or initialized. Elasticity buffer errors indicate that the elasticity buffer function in the PHY had an overflow or underflow, indicating a transmit clock error somewhere in the network.
MAC Status/Characteristics /Counters	This table displays the status, characteristics, and counters of the Media Access Control (MAC) entities on the station. DECelms may omit certain fields if optional information is not returned by the station.
	Negotiated TRT — The target token rotation time (TTRT) that is being used by all the MACs on the ring. The TTRT is negotiated during the claim token process. The negotiated TTRT value is referred to as T_Neg in the ANSI FDDI specifications.
	Requested TRT — The token rotation time (the ANSI FDDI parameter T_Req) that the MAC will initially request in the claim token process.

Table 5–22 (Cont.): SIF Operation Information Display Fields

Display Field	Description
	TVX — The valid transmission time (the ANSI FDDI parameter TVX) used by the MAC. If the MAC does not receive a valid frame or unrestricted token within the valid transmission time, it initializes the ring.
	Maximum TRT — The maximum token rotation time (the ANSI FDDI parameter T_Max) that the MAC will allow to be negotiated in the claim token process.
	Minimum TRT — The minimum token rotation time (the ANSI FDDI parameter T_Min) that the MAC will allow to be negotiated in the claim token process.
	Frame Count — The total number of frames received by the MAC, including those frames that the MAC stripped from the ring and those that it merely repeated. This total includes MAC (Media Access Control) frames other than tokens, SMT (Station Management) frames, LLC (Logical Link Control) frames, and other FDDI frames.
	Error Count — The number of error frames detected by the MAC; that is, the number of times that the MAC changed the E (error detected) field in a frame from R to S. This total does not include error frames that were previously detected by other MACs.
	Lost Count — The number of times that the MAC detected a frame (other than a token) that was improperly terminated. When the MAC detects an improperly terminated frame, it strips the rest of the frame from the ring and replaces it with Idle symbols.
	Frames Received — The number of frames received by the MAC that were addressed to the station itself, either by its individual address, a multicast address, or the broadcast address.
	Frames Xmitted — The number of frames transmitted by the MAC that originated from the station itself.
	Frames Not Copied — The number of frames destined for the station itself that the MAC was not able to copy because of a shortage of receive buffers or some other problem.

Table 5–22 (Cont.): SIF Operation Information Display Fields

Display Field	Description
	T Priority *n* ms — The threshold, in milliseconds, for transmitting frames with the priority indicated by *n*. If less than this number of milliseconds remains in the target token rotation time, the station cannot transmit frames with the given priority. DECelms displays the field for each of the three priority levels.
	Synchonous Bandwidth Allocation — The amount of time, in milliseconds, that is allocated for the transmission of synchronous traffic.
Manufacturer's OUI	The organization unique ID of the manufacturer of the station, which is assigned the IEEE address administration. For Digital stations, the value 08-00-2B appears in this field.
Manufacturer's Data	Up to 29 ASCII characters of information entered by the manufacturer of the station, such as internal revision numbers and part numbers. DECelms displays periods (.) for unprintable ASCII characters.
User Data	Up to 32 ASCII characters of user-entered information, such as the office number or physical location of the station. DECelms displays periods (.) for unprintable ASCII characters.

An example of the SHOW SIF OPERATION display for a Request Denied response follows. Table 5–23 describes the fields of this display. The display header shows the current date and time, along with the name and address of the target device. (DECelms does not display the name unless the device is registered in the DECelms registry.) The header also shows the name and address of the DECconcentrator 500 that served as the SMT agent for the request.

```
SIF Operation Information                    As of: 27-APR-1990 11:21:15
Name:                                         Address: 07-00-4B-89-2A-31
Gateway Name: GRANDCENTRAL            Gateway address: 08-00-2B-98-3A-97

Rejected Request Class:                  SIF Operation Request
Request Rejected Reason:                 Unsupported Frame Class
Station ID:                              00-00-07-00-4B-89-2A-31
SMT Version ID:                          1
SMT Supported Versions:                  1
```

Table 5–23: SIF Operation Information Request Denied Display Fields

Display Field	Description
Rejected Request Class	The type of SMT request that caused the Request Denied response.
Request Rejected Reason	The reason that the SIF Configuration Request was unsuccessful: Target Address Not Reachable — The DECconcentrator 500 that is serving as the SMT agent cannot communicate with the target station. Unsupported SMT Version — The target station does not comply with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1. Unsupported Frame Class — The target station does not support SIF Configuration Information frames. Target Cannot Parse the Request — The target station cannot currently process the SIF Configuration Request sent by the SMT agent.
Station ID	The 64-bit SMT station ID of the station. The station ID is 8 hex bytes in the form *nn-nn-nn-nn-nn-nn-nn-nn*. The first two bytes are implementation specific (zero in Digital's implementation); the last six bytes are the IEEE universally administered 48-bit address of the station.
SMT Version ID	The version number of the FDDI Station Management (SMT) protocol used on the station. Note that this is not the revision number of the SMT standard document.
SMT Supported Versions	The version numbers of the FDDI Station Management (SMT) protocol supported by the station.

5.5.3 Displaying a Map of the FDDI Ring

The SHOW MAP command creates a map of the FDDI ring, showing the name, station type, station ID, MAC addresses, active physical ports (for wiring concentrators), and connections of the stations on the ring. The ring must contain a sufficient number of stations that comply with the FDDI Station Management (SMT) ANSI draft standard Revision 5.1. The station manufacturer is irrelevant.

You must include VIA *concentrator-id*, where *concentrator-id* is the name or 48-bit address of any active DECconcentrator 500. The DECconcentrator 500 serves as an SMT agent for your request. It responds to the SHOW MAP command by sending an SMT Status Information Frame (SIF) Configuration Request to each station on the ring. The DECconcentrator 500 then uses the SIF Configuration Response frames to create the map information and sends it to the DECelms system. DECelms displays the MAP on your screen.

To send the map to a file rather than displaying it on your screen, include the phrase TO *file-spec*. You can specify the file name but not the node name, device name, or directory. DECelms places the file in the current default directory.

The following command displays a map of the FDDI ring on the DECelms screen. The wiring concentrator NORTHSTATION serves as the SMT agent, sending SIF Configuration Request frames to the stations on the ring and using the responses to build the map.

```
ELMS> SHOW MAP VIA NORTHSTATION
```

The following command writes a map of the FDDI ring to the file MAP.TXT, which DECelms places in the current default directory. The DECconcentrator 500 with the address 08-00-2B-99-3A-3C serves as the SMT agent for the request.

```
ELMS> SHOW MAP VIA 08-00-2B-99-3A-3C TO MAP.TXT
```

5.6 Using a LAN Bridge 200 as a LAN Monitor

A LAN Bridge 200 can also serve as a LAN monitor, allowing you to observe the utilization, throughput, and other characteristics of the LANs to which the bridge is attached. The monitor function does not affect the normal forwarding and filtering of the bridge; it continues to operate at full performance. Do not confuse this functionality with the LAN Traffic Monitor (LTM) software, which is described in Section 2.5.1 of this manual and in the LAN Traffic Monitor documentation.

The MONITOR command starts the monitoring function on the line that you specify, allowing you to observe the operation of the LAN to which the line is attached. The optional phrase EVERY *nn* SECONDS or EVERY *nn* MINUTES sets the **monitoring interval**, the rate at which DECelms will update the display. The default (and minimum) monitoring interval is 6

seconds. The following commands start the monitor on line 1 of the bridge RIALTO and update the display every 30 seconds:

```
ELMS> USE RIALTO LINE 1
ELMS> MONITOR EVERY 30 SECONDS
```

DECelms displays the first LAN Bridge 200 Line Monitor screen display, the Network Traffic Summary display. Pressing Return moves you from one screen to the next. Table 5–24 summarizes the four line monitor screens, which are fully described in Sections 5.6.1 through 5.6.4.

Table 5–24: LAN Bridge 200 Line Monitor Screens

Screen	Description
Network Traffic Summary Display	Summarizes LAN utilization, throughput, and errors from three different time periods: the last monitoring interval, the entire monitor uptime, and the period since the monitoring bridge was initialized. Also shows peak and average values.
Current Port Throughput Statistic Display	Displays the LAN utilization and port throughput during the last monitoring interval, which is 6 seconds by default. You can specify a different interval with the EVERY option of the MONITOR command.
Long-Term Port Throughput Statistic Display	Displays the LAN utilization and port throughput during the entire monitor uptime.
Peak LAN Utilization and Port Throughput Statistic Display	Shows the peak LAN utilization, port throughput, and percentage of multicast frames since the monitoring bridge was initialized.

5.6.1 Network Traffic Summary Display

The first screen of the LAN Bridge 200 Line Monitor, the Network Traffic Summary Display, is shown below. This screen summarizes statistics from three different time periods: the last monitoring interval, the entire monitoring period, and the period since the monitoring bridge was initialized. The statistics show LAN utilization, port throughput, and errors.

The top line of the display header shows the current date and time and the length of time since the monitor was invoked (the Monitor Uptime). The second line shows the name and address of the bridge that contains the line being monitored, the number of the line being monitored, and the interval at which DECelms is updating the display. Table 5–25 describes the fields in this display.

```
Monitor Line 1 Every 6 Seconds          As of: 27-APR-1990 18:19:43
Name: DEBAM                              Address: 08-00-2B-12-45-23
Current time: 27-APR-1990 19:21:47      Elapsed time: 0 01:02:02

                        Network Traffic Summary Display

             Utilization      Frames/Sec   Multicast Frames (% of traffic)
Current          4.8 %          542.3                  7
Peak             5.1 %          701.2                  9
Average          4.9 %          598.4                  7

Since Bridge Started:              Count          %Total
Total Frames Rec:               14876290      100.0000 %
CRC Errors Received:                 116        0.0080 %
Oversized Frames Received:             0        0.0000 %
Multicast Sources Received:            0        0.0000 %
```

Table 5–25: Network Traffic Summary Display Fields

Display Field	Description
Current	Utilization — The percentage of the Ethernet capacity utilized during the last monitoring interval. Frames/Sec — The throughput, in frames per second, transmitted during the last monitoring interval. Multicast Frames — The percentage of the total frames transmitted that had multicast destination addresses during the last monitoring interval.
Peak	Utilization — The highest percentage utilization of Ethernet capacity during the entire monitoring period. Frames/Sec — The highest throughput, in frames per second, transmitted during the entire monitoring period. Multicast Frames — The highest percentage (during the entire monitoring period) of the total frames transmitted that had multicast destination addresses.

Table 5–25 (Cont.): Network Traffic Summary Display Fields

Display Field	Description
Average	Utilization — The average percentage utilization of the Ethernet capacity during the entire monitoring period.
	Frames/Sec — The average throughput, in frames per second, transmitted during the entire monitoring period.
	Multicast Frames — The average percentage (during the entire monitoring period) of total frames transmitted that had multicast destination addresses.
Total Frames Rec	Count — The total number of frames transmitted since the monitoring bridge was initialized.
CRC Errors Received	Count — The total number of frames with cyclic redundancy check (CRC) errors transmitted since the monitoring bridge was initialized.
	%Total — The percentage of the total frames transmitted that contained CRC errors. This percentage covers the period since the monitoring bridge was initialized.
Oversized Frames Received	Count — The total number of frames transmitted that were larger than the legal size limit. This total covers the period since the monitoring bridge was initialized.
	%Total — The percentage of the total frames transmitted that were larger than the legal size limit. This percentage covers the period since the monitoring bridge was initialized.
Multicast Sources Received	Count — The number of frames with multicast source addresses transmitted since the monitoring bridge was initialized.
	%Total — The percentage of the total frames transmitted that had multicast source addresses. This percentage covers the period since the monitoring bridge was initialized.

5.6.2 Current Port Throughput Statistic Display

The second screen of the LAN Bridge 200 Line Monitor, the Current Port Throughput Statistic Display, is shown below. This screen shows capacity utilization and frame throughput on the line during the last monitoring interval, which is 6 seconds by default. You can specify a different interval with the EVERY option of the MONITOR command.

The top line of the display header shows the current date and time and the length of time since the monitor was invoked (the Monitor Uptime). The second line shows the name and address of the bridge that contains the line being monitored, the number of the line being monitored, and the monitoring interval at which DECelms is updating the display. Table 5–27 describes the fields of this display.

```
Monitor Line 1 Every 6 Seconds              As of: 27-APR-1990 18:19:43
Name: DEBAM                                  Address: 08-00-2B-12-45-23
Current time: 27-APR-1990 19:21:47          Elapsed time: 0 01:02:02

           Long-Term Port Throughput Statistic Display

        Byte Count Since Uptime      Bytes/Sec     Byte Util %
Multicast:              283826         14938.2      1.2 %
Single-Dest:             20996          1105.1      0.1 %
Total  Bytes:           304822         16043.3      1.3 %

         Frame Count Since Uptime    Frames/Sec    Total Traffic %
Multicast:                2897           152.5     96.8 %
Single-Dest:                59             3.1      3.2 %
Total Frames:             2956           155.6    100.0 %
```

Table 5–27: Long Term Port Throughput Statistic Display Fields

Display Field	Description
Multicast	Byte Count Since Uptime — The number of bytes in frames sent to multicast addresses during the entire monitor uptime.
	Bytes/Sec — The number of bytes per second that this represents.
	Byte Util % — The percentage of the Ethernet capacity utilized by frames sent to multicast addresses.
Single-Dest	Byte Count Since Uptime — The number of bytes in frames sent to physical addresses (which identify a single station) during the entire monitor uptime.
	Bytes/Sec — The number of bytes per second that this represents.
	Byte Util % — The percentage of the Ethernet capacity utilized by frames sent to physical addresses.

Table 5–27 (Cont.): Long Term Port Throughput Statistic Display Fields

Display Field	Description
Total Bytes	Byte Count Since Uptime — The number of bytes in all the frames transmitted during the entire monitor uptime.
	Bytes/Sec — The number of bytes per second that this represents.
	Byte Util % — The percentage of the Ethernet capacity utilized during the entire monitor uptime.
Multicast	Frame Count Since Uptime — The number of frames sent to multicast addresses during the entire monitor uptime.
	Frames/Sec — The throughput, in frames per second, that this represents.
	Total Traffic % — The percentage of the Ethernet capacity utilized by frames sent to multicast addresses.
Single-Dest	Frame Count Since Uptime — The number of frames sent to physical addresses (which identify a single station) during the entire monitor uptime.
	Frames/Sec — The throughput, in frames per second, that this represents.
	Total Traffic % — The percentage of the Ethernet capacity utilized by frames sent to physical addresses.
Total Frames	Frame Count Since Uptime — The total number of frames transmitted during the entire monitor uptime.
	Frames/Sec — The throughput, in frames per second, that this represents.
	Total Traffic % — The percentage of the Ethernet capacity utilized during the entire monitor uptime.

5.6.4 Peak LAN Utilization and Port Throughput Statistic Display

The fourth screen of the LAN Bridge 200 Line Monitor, the Peak LAN Utilization and Port Throughput Statistic Display, is shown below. This screen shows the peak LAN utilization, port throughput, and percentage of multicast frames since the monitoring bridge was initialized.

The top line of the display header shows the current date and time and the length of time since the monitor was invoked (the Monitor Uptime). The second line shows the name and address of the bridge that contains the line being monitored, the number of the line being monitored, and the monitoring interval at which DECelms is updating the display. Table 5–26 describes the fields of this display.

```
Monitor Line 1 Every 6 Seconds            As of: 27-APR-1990 18:19:43
Name: DEBAM                                Address: 08-00-2B-12-45-23
Current time: 27-APR-1990 19:21:47        Elapsed time: 0 01:02:02

         Current Port Throughput Statistic Display

        Byte Count Last Interval     Bytes/Sec    Byte Util %
Multicast:                26484        13242.0    1.1 %
Single-Dest:               3597         1798.5    0.1 %
Total  Bytes:             30081        15040.5    1.2 %

         Frame Count Last Interval   Frames/Sec   Total Traffic %
Multicast:                  279          139.5     96.5 %
Single-Dest:                 10            5.0      3.5 %
Total Frames:               289          144.5    100.0 %
```

Table 5–26: Current Port Throughput Statistic Display Fields

Display Field	Description
Multicast	Byte Count Last Interval — The number of bytes in frames sent to multicast addresses during the last monitoring interval.
	Bytes/Sec — The number of bytes per second that this represents.
	Byte Util % — The percentage of the Ethernet capacity utilized by frames sent to multicast addresses.
Single-Dest	Byte Count Last Interval — The number of bytes in frames sent to physical addresses (which identify a single station) during the last monitoring interval.
	Bytes/Sec — The number of bytes per second that this represents.
	Byte Util % — The percentage of the Ethernet capacity utilized by frames sent to physical addresses.

Table 5–26 (Cont.): Current Port Throughput Statistic Display Fields

Display Field	Description
Total Bytes	Byte Count Last Interval — The number of bytes in all the frames transmitted during the last monitoring interval.
	Bytes/Sec — The number of bytes per second that this represents.
	Byte Util % — The percentage of the Ethernet capacity utilized during the last monitoring interval.
Multicast	Frame Count Last Interval — The number of frames sent to multicast addresses during the last monitoring interval.
	Frames/Sec — The throughput, in frames per second, that this represents.
	Total Traffic % — The percentage of the Ethernet capacity utilized by frames sent to multicast addresses.
Single-Dest	Frame Count Last Interval — The number of frames sent to physical addresses (which identify a single station) during the last monitoring interval.
	Frames/Sec — The throughput, in frames per second, that this represents.
	Total Traffic % — The percentage of the Ethernet capacity utilized by frames sent to physical addresses.
Total Frames	Frame Count Last Interval — The total number of frames transmitted during the last monitoring interval.
	Frames/Sec — The throughput, in frames per second, that this represents.
	Total Traffic % — The percentage of the Ethernet capacity utilized during the last monitoring interval.

5.6.3 Long-Term Port Throughput Statistic Display

The third screen of the LAN Bridge 200 Line Monitor, the Long Term Port Throughput Statistic Display, is shown below. This screen shows capacity utilization and frame throughput on the line during the entire monitor uptime, which, in this example, is 2 hours, 44 minutes, and 52 seconds.

The top line of the display header shows the current date and time and the length of time since the monitor was invoked (the Monitor Uptime). The second line shows the name and address of the bridge that contains the line being monitored, the number of the line being monitored, and the monitoring interval at which DECelms is updating the display. Table 5–28 describes the fields of this display.

```
Monitor Line 1 Every 6 Seconds              As of: 27-APR-1990 18:19:43
Name: DEBAM                                  Address: 08-00-2B-12-45-23
Current time: 27-APR-1990 19:21:47          Elapsed time: 0 01:02:02

    Peak LAN Utilization and Port Throughput Statistic Display

Description                 Peak Value      Seen By ELMS at:

LAN Utilization:            5.97 %          27-APR-1990 12:35:26.19

Frames/Sec:                 814.8           27-APR-1990 12:35:26.54

Multicast Ratio:            9.48 %          27-APR-1990 12:35:26.25
```

Table 5–28: Peak LAN Utilization and Port Throughput Statistic Display Fields

Display Field	Description
LAN Utilization	The highest percentage utilization of Ethernet capacity since the monitoring bridge was initialized.
Frames/Sec	The highest throughput, in frames per second, transmitted since the monitoring bridge was initialized.
Multicast Ratio	The highest percentage (since the monitoring bridge was initialized) of total frames transmitted that had multicast destination addresses.

6 Troubleshooting with DECelms

This chapter contains examples of using DECelms (DEC Extended LAN Management Software) to troubleshoot the prevalent network problems listed below. Each example contains a description of the symptoms, an explanation of the problems, and a step-by-step troubleshooting procedure.

- LAN Segmentation
- Nodes Cannot Communicate
- Only Some Frames Get Through
- Screaming Node
- Broadcast Storm
- Bridge Cannot Down-Line Load LTM

6.1 LAN Segmentation

Symptoms

All the nodes on a local area network (LAN) segment are unable to communicate with systems beyond their segment. However, all the nodes on the isolated LAN segment can still communicate among themselves.

Explanation

Potential causes of this problem include the following:

- The bridge connecting the isolated segment to the rest of the extended LAN failed or was accidentally disconnected.
- The repeater connecting the isolated Ethernet/IEEE 802.3 segment to the rest of the extended LAN failed or was accidentally disconnected.
- The Ethernet/IEEE 802.3 transceiver for the bridge is faulty.
- A problem may exist on the LAN on the other side of the bridge (for example, a screaming node) that causes the bridge to segment.
- The bridge is improperly configured.

The problem may also be caused by the address and protocol filtering used on the bridge. For more information about troubleshooting address filtering, see the Nodes Cannot Communicate example. The Only Some Frames Get Through example shows how to troubleshoot protocol filtering.

Troubleshooting Strategy

To begin solving this problem, use your knowledge of the network topology and your network map to isolate the source of the problem to the interconnecting bridge for the isolated LAN segment. After you find the bridge, perform the troubleshooting procedure. If two or more bridges connect the isolated segment to the rest of the extended LAN, perform the following troubleshooting procedure for each bridge. If the problems persist, check the address and protocol filtering on the bridge, as described in the Nodes Cannot Communicate and the Only Some Frames Get Through examples.

Troubleshooting Procedure

To troubleshoot the LAN segmentation problem, perform the following steps:

1. Enter the following commands to check the status of the bridge, where *bridge-id* is the name or address of the bridge:

```
ELMS> USE bridge-id
ELMS> SHOW STATUS
```

DECelms displays:

```
Show Device Status                          As of: 27-APR-1990 11:19:12
Name: bridge-name                            Address: 08-00-2B-nn-nn-nn

Device State:                                        OPERATE
Current Forwarding Database Entries:                 100
Current Nonvolatile Forwarding Database Entries:     10
Current Protocol Database Entries:                   10
Current Nonvolatile Protocol Database Entries:       10
Management Request Heard Port:                       2
LAN Bridge 100 Being Polled:                         08-00-2B-04-34-9B
Spanning Tree Mode:                                  LAN Bridge 100
Inactive Forwarding Database Entries:                31
Time Since Forwarding Database Purged:               27
Device Broken Reason:
NVRAM Failed Flag:                                   False
Time Since Last Hello Sent:                          0
Device Configuration:

   FRU Type         FRU State      FRU Id      FRU Revision
   --------         ---------      ------      ------------
   AP Card          Working         N/A        Revision 1.0
   FI Card          Working         N/A        Revision 1.0
   NI Card          Working         N/A        Revision 1.0
   QM Card          Marginal        N/A        Revision 1.0
```

Check the value in the Device State field.

   a. OPERATE indicates that the bridge is operating normally.

   b. INIT indicates that the bridge is performing its self-test and initialization sequence; if the bridge is in good condition, it should become operational shortly.

   c. If the device state is BROKEN, call your customer support representative to arrange for repair or replacement of the bridge.

For DECbridge 500 models, DECelms also displays the Device Configuration field, as shown in the preceding display. Call your Digital customer support representative if any of the bridge field replaceable units (FRUs) are Marginal or Broken.

2. Next, verify that the bridge is properly configured by entering the following DECelms commands:

```
ELMS> USE bridge-id
ELMS> SHOW CHARACTERISTICS
```

DECelms displays:

```
Show Device Characteristics             As of: 27-APR-1990 11:19:12
Name: bridge-name,                        Address: 08-00-2B-nn-nn-nn

Node ID (root priority/address):                 128/08-00-2B-nn-nn-nn
Software Implementation Type:                    DEBAM
Software Version:                                1.2
ROM Implementation Type:                         DEBAM
ROM Version:                                     1.2
Hardware Version Number:                         1.0
LAN Bridge 100 Spanning Tree Version:            2
802 Spanning Tree Version:                       0
Max Forwarding Database Entries:                 15871
Max Non-Volatile Forwarding Database Entries:    400
Max Protocol Database Entries:                   64547
Non-Volatile Protocol Database Entries:          300
Forwarding Database Purge Threshold:             15614
Port Count:                                      2
Downline Load Switch:                            Disabled
Downline Load File Name:
Downline Load Physical Switch:                   Disabled
Last Load Host:                                  AA-00-04-00-32-A3
Upline Dump Switch:                              Enabled
Preferred Dump Host:                             AA-00-04-00-32-A3
Last Dump Host:                                  AA-00-04-00-32-A3
Bridge Only Switch:                              Enabled
Reset Defaults Switch:                           Disabled
Port Test Passed Threshold:                      10
Port Test Interval:                              60
Topology Change Timer:                           0
Manual Filter Switch:                            True
Update Switch:                                   N/A
Fragmentation Switch:                            N/A
```

a. If the Software Implementation Type field has the value LTM, the bridge is serving as a LAN Traffic Monitor (LTM) listener rather than as a bridge. LTM listeners do not forward traffic or perform any other bridge functions. If the bridge is not intended to be an LTM listener, you must alter the bridge's configuration, as described in steps b, c, and d.

b. Check that the value Disabled appears in both the Downline Load Switch and the Downline Load Physical Switch fields. A bridge cannot serve as a bridge unless both of these switches are disabled; instead, it will keep requesting a down-line load of software.

c. Manually disable the Down-Line Load hardware switch if it is set to Enabled, as described in the hardware documentation for the bridge.

d. To disable the Down-Line Load software switch, enter the following commands. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, also enter PASSWORD and the bridge's password.

```
ELMS> USE bridge-id
ELMS> SET LOAD SWITCH FALSE PASSWORD password
```

e. If the bridge is a LAN Bridge 200, also check the value in the Manual Filter Switch field. If this switch is set to True, the bridge will forward a frame only if there is an entry (added with DECelms) with the disposition FORWARD for the source or destination address of the frame. See the Nodes Cannot Communicate example for more information on this problem.

3. Enter the following DECelms commands to verify that both lines on the bridge are in the FORWARDING state:

```
ELMS> USE bridge_id
ELMS> SHOW KNOWN LINES SPANNING CHARACTERISTICS
```

DECelms displays the following for each line on the bridge:

```
Line Spanning Characteristics for Line 1  As of: 27-APR-1990 11:21:52
Bridge: bridge-name                           Address: 08-00-2B-nn-nn-nn

Local Network Module State:         FORWARDING
Port Cost:                          10
Designated Bridge ID:               128 /08-00-2B-0C-1B-A6
Designated Bridge Link Number:      1
Designated Bridge Root ID:          10 /08-00-2B-06-25-C7
Root Path Cost:                     40
Designated Root Age:                0
RTM Flag:                           N/A
Forward Delay Timer:                0
Bad Hello Count:                    0
Possible Loop Flag:                 False
Topology Changed Flag:              False
Disable Switch:                     Disabled
```

For all bridge models, check the Local Network Module State field to ensure that both lines on the bridge are in the FORWARDING state.

a. If the line state is INIT or PREFORWARDING, the bridge should begin forwarding frames shortly.

b. If the line state is BACKUP, DISABLED, or BROKEN, check your topology map to see if there is another bridge serving the segment and follow the steps in this example for that bridge. Call your Digital customer service representative to repair any lines that are in the BROKEN state.

c. If the line state is DISABLED and there is no backup bridge serving the segment, enter the following commands to reenable the line, where *line-number* is the number of the target line. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password.

```
ELMS> USE bridge-id LINE line-number
ELMS> ENABLE PASSWORD password
```

4. If a repeater connects the isolated segment to the rest of the extended LAN, perform the following steps to ensure that the repeater is operational:

   a. Locate the repeater for the isolated segment.

   b. Make sure that the power is on.

   c. Make sure that the cable connecting the repeater to the transceiver or DELNI is properly inserted.

   d. Run the self-test, as described in the hardware documentation for the repeater.

   e. Check the indicator lights on the repeater. The SEGMENTED light usually indicates a circuit problem.

   f. For further corrective actions, see the hardware documentation for the repeater.

5. If the segment is still isolated, perform the following steps to check the transceiver that connects the bridge to the isolated segment (tranceivers are used only on bridge Ethernet/IEEE 802.3 lines):

   a. Go to a node on the other segment to see if that node can communicate with the bridge. If the node on the other segment can reach the bridge, then the transceiver that connects the bridge to the local segment is probably broken.

b. Check that the connections are secure.

c. If the connections are secure and the segment is still isolated, move the bridge to another transceiver or DELNI port.

6. If the segment is still isolated, check the address and protocol filtering on the bridge, as described in the Nodes Cannot Communicate and Only Some Frames Get Through examples.

Recommendations

To avoid the LAN segmentation problem, follow these recommendations:

- Be sure to follow the guidelines for configuring your network with bridges. You can configure a maximum of seven bridges in a linear configuration (from point A to point B).
- Be sure to follow the guidelines for configuring repeaters on your network. You can configure a maximum of two repeaters in a linear configuration (from point A to point B). (A pair of fiber optic repeaters counts as one repeater.)
- If possible, include redundant bridges and repeaters on your network. The redundant devices provide service if a primary device fails, helping to ensure uninterrupted service for your users.

6.2 Nodes Cannot Communicate

Symptoms

A node cannot communicate with another node on the extended local area network (LAN), but the node can communicate with all the nodes on its own segment. However, other nodes on the same segment are not having problems communicating across the extended LAN.

Explanation

If the bridges and other devices between the two nodes are operational and properly configured (see the LAN Segmentation example), this problem is usually caused by improper address filtering or protocol filtering (see the Nodes Cannot Communicate example). For each bridge on the path betwen the nodes, you must check for the potential problems shown below. For all bridge models, the cause of the problem could be that there is an address entry with the disposition FILTER for the address of the destination node.

For the LAN Bridge 200 and the Ethernet/IEEE 802.3 line of a DECbridge 500, there may be an address entry in the forwarding database of the bridge instructing the bridge to filter (discard) frames sent from the source node. The DECbridge 500 does not apply source address filtering to frames received on its FDDI line.

For the LAN Bridge 200, the problem may be that the Manual Filter software switch on the bridge is set to True and there are no address entries with the disposition FORWARD for the nodes that cannot communicate.

The problem may also be caused by protocol filtering, as described in the Only Some Frames Get Through example.

Troubleshooting Strategy

To begin solving this problem, use your knowledge of the network topology and your network map to identify the bridges between the two nodes that cannot communicate. In the cases where there are redundant bridges connecting segments, use the SHOW STATUS command to identify the active bridge, as described in the LAN Segmentation troubleshooting example. Perform the following troubleshooting procedure for each bridge in the path between the nodes that cannot communicate.

Troubleshooting Procedure

Perform the following steps for all bridge models:

1. Check to see if there is an address entry for the address of the destination node with the disposition FILTER. Enter the following commands, where *bridge-id* is the name or address of the target bridge and *address* is the address of the destination node:

   ```
   ELMS> USE bridge-id
   ELMS> SHOW ADDRESS address
   ```

   DECelms displays:

   ```
   Forwarding Entry                                    As of: 27-APR-90 18:22:50
   Name: bridge-name                                    Address: bridge-address

   Forwarding Entry:  address
   Set by:            MANAGEMENT
   Outbound Line:     NONE
   Last Seen on Line: NONE
   Disposition:       FILTER
   Aging:             FIXED
   ```

2. If the disposition of the entry is ALWAYS FILTER, enter the following command to restore normal forwarding, where *address* is the address of the entry. If the target bridge is a LAN Bridge 150, LAN Bridge 200, or DECbridge 500 that has a password set, you must include PASSWORD and the bridge's password.

   ```
   ELMS> SET ADDRESS address DISPOSITION FORWARD PASSWORD password
   ```

3. If the disposition of the entry is LEARNED and the entry was set by DECelms (MANAGEMENT), check that the line number in the Outbound Line field (set by DECelms) matches the line number in the Last Seen on Line field. If there is a discrepancy, modify the outbound line of the entry so that it matches the line on which the bridge last heard the station transmitting (the Last Seen on Line field). The following command modifies the outbound line of an entry:

   ```
   ELMS> SET ADDRESS address LINE line-number PASSWORD password
   ```

Perform the following additional step for LAN Bridge 200 and DECbridge 500 models:

4. Ensure that the entry for the address of the source node is set to FORWARD, as described in step 2.

   Perform the following additional steps for LAN Bridge 200 models:

5. Check the setting of the Manual Filter software switch on the bridge by entering the SHOW CHARACTERISTICS command:

```
ELMS> USE bridge-id
ELMS> SHOW CHARACTERISTICS
```

DECelms displays:

```
Show Device Characteristics            As of: 27-APR-1990 11:19:12
Name: bridge-name                       Address: 08-00-2B-nn-nn-nn

Node ID (root priority/address):                  128/08-00-2B-nn-nn-nn
Software Implementation Type:                     DEBAM
Software Version:                                 1.2
ROM Implementation Type:                          DEBAM
ROM Version:                                      1.2
Hardware Version Number:                          1.0
LAN Bridge 100 Spanning Tree Version:             2
802 Spanning Tree Version:                        0
Max Forwarding Database Entries:                  15871
Max Non-Volatile Forwarding Database Entries:     400
Max Protocol Database Entries:                    64547
Non-Volatile Protocol Database Entries:           300
Forwarding Database Purge Threshold:              15614
Port Count:                                       2
Downline Load Switch:                             Disabled
Downline Load File Name:
Downline Load Physical Switch:                    Disabled
Last Load Host:                                   AA-00-04-00-32-A3
Upline Dump Switch:                               Enabled
Preferred Dump Host:                              AA-00-04-00-32-A3
Last Dump Host:                                   AA-00-04-00-32-A3
Bridge Only Switch:                               Enabled
Reset Defaults Switch:                            Disabled
Port Test Passed Threshold:                       10
Port Test Interval:                               60
Topology Change Timer:                            0
Manual Filter Switch:                             True
Update Switch:                                    N/A
Fragmentation Switch:                             N/A
```

6. If the Manual Filter software switch is set to False, you do not need to take further action, since the bridge will filter a frame only if there is a management entry for its source or destination address with the disposition FILTER.

7. If the Manual Filter software switch is set to True, you must ensure that there is an entry with the disposition FORWARD for the addresses of the source and destination nodes. The following commands add an entry, where *address* is the address of the node:

```
ELMS> ADD ADDRESS address DISPOSITION FORWARD PASSWORD password
```

8. If the nodes still cannot communicate, check the protocol filters on the bridge, as described in the Only Some Frames Get Through example.

6.3 Only Some Frames Get Through

Symptoms

Certain types of frames do not reach the nodes on a segment, but other frames do. All of the nodes on the segment have the problem with the same types of frames. For example, the nodes on a segment can communicate with other nodes on the extended local area network (LAN) using DECnet software, but users on terminal servers cannot connect to the nodes.

Explanation

If the bridges and other devices between the two nodes are operational and properly configured, and address filtering is properly implemented, this problem is usually caused by improper protocol filtering on a LAN Bridge 200 or a DECbridge 500. For each LAN Bridge 200 and DECbridge 500 on the path between the nodes that cannot communicate, the potential problems include:

- An entry in the protocol database of the bridge instructs it to filter (discard) frames that contain certain protocol information. For example, a protocol entry may instruct the bridge to filter Ethernet frames that contain Local Area Transport (LAT) protocol information.
- An entry in the protocol database of the bridge instructs it to filter (discard) frames that contain protocols for which there are no explicit entries with the disposition FORWARD. For example, the OTHER TYPES entry might be set to FILTER, instructing the bridge to filter all Ethernet frames unless there is an entry for the Protocol Type of the frame with the disposition FORWARD.

Troubleshooting Strategy

To begin solving this problem, use your knowledge of the network topology and your network map to identify the bridges between the two nodes that cannot communicate. In the cases where there are redundant bridges connecting segments, use the SHOW STATUS command to identify the active bridge, as described in the LAN Segmentation troubleshooting example. For each bridge in the path between the nodes that cannot communicate:

1. Check the operational state and configuration of the bridge, as described in the LAN Segmentation example.
2. Check the address filters on the bridge, as described in the Nodes Cannot Communicate example.

3. Check the protocol filters on the bridge by performing the troubleshooting procedure in this example.

Troubleshooting Procedure

In this example, the problem is that terminal server users cannot connect to the nodes on a segment.

1. Find the protocol value for Local Area Transport (LAT), the protocol used by terminal servers to communicate with host nodes. Since LAT is a Digital Ethernet Protocol Type, check Table C–2, Digital Ethernet Protocol Types, in Appendix C. The value for the Protocol Type DEC_LAT is 60-04.

2. Check to see if there is a protocol entry for LAT in the protocol database of the bridge. Enter the SHOW PROTOCOL command, as shown below. The VALUE is 60-04, the Protocol Type value for LAT.

   ```
   ELMS> USE bridge-id
   ELMS> SHOW PROTOCOL 60-04
   ```

   DECelms displays:

   ```
   Protocol Filter Forwarding Entry       As of: 27-APR-90 17:07:54
   Name: bridge-name                    Address: 08-00-2B-nn-nn-nn

   Protocol Kind:     Ethernet Type
   Protocol Value:    60-04
   Disposition:       FILTER
   Volatility:        Permanent
   ```

   The protocol entry for LAT is set to FILTER, instructing the bridge to discard Ethernet frames that contain the LAT protocol. Before changing the disposition of the entry or removing it, check the type of filtering implemented for Ethernet frames, as described in step 3.

   Even if there is no entry for the LAT protocol, the bridge will filter Ethernet frames containing the LAT protocol if selective protocol forwarding is used on the bridge, as described in step 5.

3. The OTHER TYPES entry shows whether exclusive protocol filtering or selective protocol forwarding is used on the bridge for Ethernet frames. The following command displays the setting of the OTHER TYPES entry:

   ```
   ELMS> SHOW PROTOCOL OTHER TYPES
   ```

4. If OTHER TYPES is set to FORWARD, the bridge uses exclusive protocol filtering for Ethernet frames. The bridge filters Ethernet frames only if there is an entry for the Protocol Type of the frame with the disposition FILTER. In this case, remove the entry for LAT, as shown below:

```
ELMS> REMOVE PROTOCOL 60-04 PASSWORD password
```

5. If OTHER TYPES is set to FILTER, the bridge uses selective protocol forwarding for Ethernet frames. The bridge forwards Ethernet frames only if there is an entry for the Protocol Type of the frame with the disposition FORWARD.

   a. If there is a protocol entry for LAT and it is set to FILTER, modify its disposition to FORWARD, as shown below:

   ```
   ELMS> SET PROTOCOL 60-04 DISPOSITION FORWARD PASSWORD password
   ```

   b. If there is no protocol entry for LAT, add one with the disposition FORWARD:

   ```
   ELMS> ADD PROTOCOL 60-04 DISPOSITION FORWARD PASSWORD password
   ```

6.4 Screaming Node

Symptoms

Users perceive very slow response time for network operations. In the Line Counters display for bridge lines, the values in the Lifetime Exceeded Frames and Transmit Multiple Collisions fields are very high.

Explanation

This problem is often caused by a device on the network that has a hardware problem, causing it to send out large amounts of data to the local area network (LAN). Such a device is called a screaming node, a screamer, a babbler, or a babbling device. Alternatively, a malicious user or a software error may be causing the problem.

Troubleshooting Strategy

First, use LAN Traffic Monitor (LTM) to find the physical address of the screaming node. Then use DECelms to determine both the LAN segment that contains the screaming node, and the physical location of the screaming node on that segment. After you determine the location of the device, use hardware diagnostic techniques to determine the cause of the problem. Finally, contain the problem as much as possible by adding entries for the address with the disposition FILTER in the forwarding databases of all the LAN Bridge 200 and DECbridge 500 models. If the bridge connecting the screaming node's segment to the extended LAN is a LAN Bridge 200 or a DECbridge 500, you may be able to contain the problem to a single segment, since LAN Bridge 200 and DECbridge 500 models filter based on both the source and destination addresses of a frame.

Troubleshooting Procedure

Perform the following steps:

1. Use LAN Traffic Monitor (LTM) to find the physical address of the screaming node.
   - From the Main Menu, select #1, Traffic Summary Displays.
   - From the Traffic Summary Displays Menu, select #3, Current Top Ten Talkers display.

- In the resulting display, note the address of the node with the highest %Total. This is the screaming node.

NOTE

> LTM only displays the addresses of devices that it recognizes. If the screaming node is generating corrupt information (such as a long stream of preamble) for its own name and address, LTM cannot help you determine the physical address or location of the node.

2. Locate the segment containing the screaming node by using DECelms to examine the forwarding databases of the bridges in the extended LAN. Figure 6–1 shows the topology of the extended LAN in this example.

   a. Check the entry for the screaming node's address in the forwarding database of the bridge B1:

```
ELMS> USE B1
ELMS> SHOW ADDRESS address
```

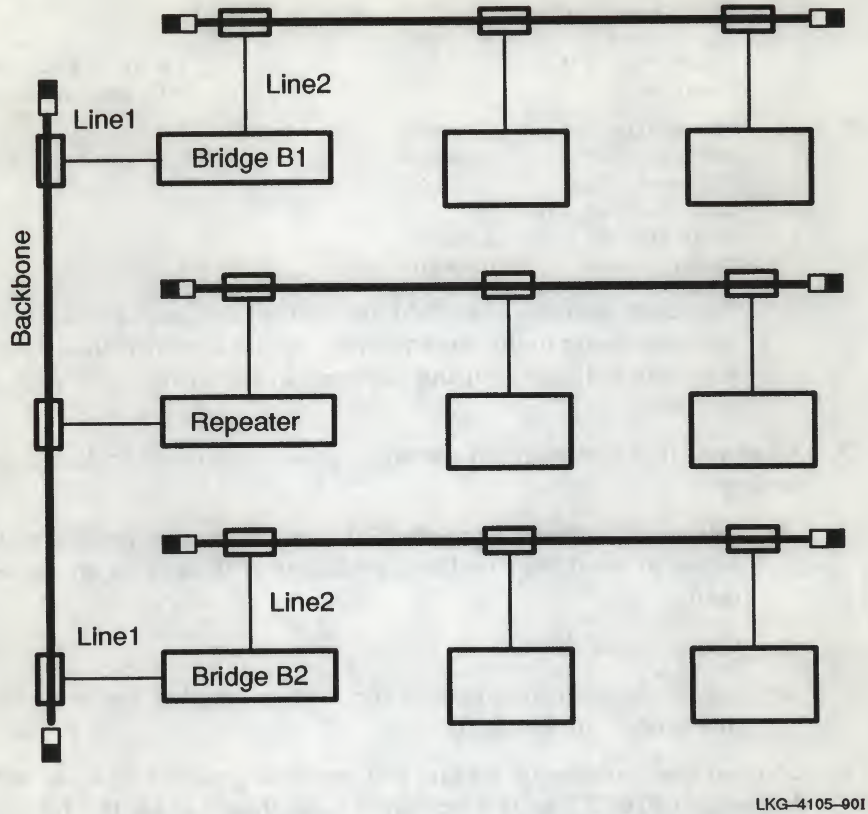
   DECelms displays:

```
Forwarding Entry                                As of: 27-APR-90 18:22:50
Name: B1                                      Address: nn-nn-nn-nn-nn-nn

Forwarding Entry:   address
Set by:             LEARNING
Outbound Line:      1
Last Seen on Line:  1
Disposition:        LINE 1
Aging:              DYNAMIC
```

   The Last Seen on Line field shows that bridge B1 last heard the screaming node transmitting on line 1, indicating that the screaming node is located on the lower part of the topology.

Figure 6–1: Extended LAN Topology



b. Next, check the entry for the screaming node's address in the forwarding database of the bridge B2:

```
ELMS> USE B2
ELMS> SHOW ADDRESS address
```

DECelms displays:

```
Forwarding Entry                                 As of: 27-APR-90 18:22:50
Name: B2                                         Address: nn-nn-nn-nn-nn-nn

Forwarding Entry:   address
Set by:             LEARNING
Outbound Line:      2
Last Seen on Line:  2
Disposition:        Line 2
Aging:              DYNAMIC
```

The Last Seen on Line field shows that bridge B2 last heard the screaming node transmitting on line 2, which indicates that the node is located on the segment in the lower right part of the topology.

3. After you find the segment containing the screaming node, do the following:

   a. Ask users on that segment if any new devices were added to the segment, or if they had any problems with devices on the segment.

   b. Check these devices for correct operation.

   c. Ask the system manager of the system causing the problem to disconnect the faulty device.

4. Contain the problem by adding the screaming node's address with the disposition FILTER to the forwarding databases of all the LAN Bridge 200 and DECbridge 500 models. This will isolate the problem as much as possible while you locate the screaming node, because the bridges will filter frames that have the source address of that node. (The DECbridge 500 does not perform source address filtering on frames received on its FDDI line.)

   a. If the LAN Bridge 200 and DECbridge 500 models do not have a password set, enter the following commands, where *address* is the address of the screaming node:

```
ELMS> USE KNOWN BRIDGES
ELMS> ADD ADDRESS nn-nn-nn-nn-nn-nn DISPOSITION FILTER
```

b. If the LAN Bridge 200 and DECbridge 500 models have the same password, enter the following commands, where *address* is the address of the screaming node and *password* is the password:

```
ELMS> USE KNOWN BRIDGES
ELMS> ADD ADDRESS nn-nn-nn-nn-nn-nn DISPOSITION FILTER
      PASSWORD password
```

c. If the LAN Bridge 200 and DECbridge 500 models have different passwords, repeat the following commands for each bridge, where *bridge-name* is the name of the bridge and *password* is its password:

```
ELMS> USE bridge-name
ELMS> ADD ADDRESS nn-nn-nn-nn-nn-nn DISPOSITION FILTER
      PASSWORD password
```

6.5 Broadcast Storm

Symptoms

Only the host computers having the highest performance CPUs and Ethernet controllers can gain access to the network. Host response time becomes slow and utilization percentage becomes very high. In the Line Counters display, the Transmit Multiple Collisions and Collision Limit Exceeded values become very high. The LAN utilization percentage values displayed by the LAN Bridge 200 Line Monitor and LAN Traffic Monitor (LTM) rise toward 100%.

Explanation

A likely explanation is that nodes are using protocols that overuse the Ethernet broadcast address. By default, the bridges are required to pass these messages on to every segment in the network, even to segments where there is no possible recipient. Every node in the network must read all the frames sent to the broadcast address.

Causes of broadcast storms include:

- Flawed protocols — Certain protocols rely on the use of the Ethernet broadcast address instead of using multicast addresses. An example is AppleTalk, which causes a burst of 20 broadcast packets for every name lookup request.
- Flawed configurations — Combinations of flawed implementations of a protocol, often the TCP/IP protocol, can cause major broadcast storms. For example, when nodes using Berkeley Standard UNIX V4.3 (BSD 4.3) are placed in a network of Berkeley Standard UNIX V4.2 (BSD 4.2) nodes, a major ARP storm often occurs. The BSD 4.2 nodes have gateway software enabled by default and consider any IP broadcast address other than zeros as an unknown address. When a BSD 4.3 node using the new ones broadcast address is added to the network, the BSD 4.2 nodes simultaneously broadcast an ARP lookup request whenever the new BSD 4.3 node uses the ones IP broadcast address. The resulting broadcast storm can have a crippling effect on network performance.

Troubleshooting Strategy

Follow this strategy to troubleshoot a broadcast storm:

1. Determine the protocol that is causing the storm.
2. Contain the problem by adding filters for the protocol in all the LAN Bridge 200 and DECbridge 500 models.
3. Identify the segment where the storm originated and resolve the problem.

Troubleshooting Procedure

To troubleshoot a broadcast storm, follow these steps:

1. First, use LAN Traffic Monitor (LTM) to determine the protocol that is causing the broadcast storm.
   a. From the LTM Main Menu, select #2, Node, Type and Multicast Traffic Displays.
   b. From the Node, Type and Multicast Traffic Displays Menu, select #4, Multicast Traffic by Type Display. LTM prompts you for a multicast address.
   c. Enter the broadcast address, FF-FF-FF-FF-FF-FF. LTM displays:

```
MC Address : FF-FF-FF-FF-FF-FF  Broadcast      Type Count : 3

Type Field 06-00 Xrx_NSIDP  Frame Count         2820           7.51%
Type Field 08-00 DOD_TCPIP  Frame Count        10272          14.09%
Type Field 08-06 TCPIP_ARP  Frame Count        10272          67.41%
```

   In this case, the broadcast storm is caused by TCP/IP, which has the Protocol Type 08-00, and by the Address Resolution Protocol (ARP), which is used by TCP/IP for locating addresses. ARP has the Protocol Type value 08-06.

2. Next, contain the problem by adding filters for the Protocol Types 08-00 and 08-06 to the protocol databases of the LAN Bridge 200 and DECbridge 500 models. These filters instruct the bridges to filter (discard) frames that contain TCP/IP or ARP protocol information. The effect is to isolate the broadcast storm as much as possible, perhaps even to a single segment if a LAN Bridge 200 or a DECbridge 500 connects the segment where the broadcast storm originated.
   a. If the LAN Bridge 200 and DECbridge 500 models do not have a password set, enter the following commands:

```
ELMS> USE KNOWN BRIDGES
ELMS> ADD PROTOCOL 08-00 DISPOSITION FILTER
ELMS> ADD PROTOCOL 08-06 DISPOSITION FILTER
```

b. If the LAN Bridge 200 and DECbridge 500 models have the same password, enter the following commands, where *password* is the password:

```
ELMS> USE KNOWN BRIDGES
ELMS> ADD PROTOCOL 08-00 DISPOSITION FILTER PASSWORD password
ELMS> ADD PROTOCOL 08-06 DISPOSITION FILTER PASSWORD password
```

c. If the LAN Bridge 200 and DECbridge 500 models have different passwords, repeat the following commands for each bridge, where *bridge-id* is the name or the address of the bridge and *password* is its password:

```
ELMS> USE bridge-id
ELMS> ADD PROTOCOL 08-00 DISPOSITION FILTER PASSWORD password
ELMS> ADD PROTOCOL 08-06 DISPOSITION FILTER PASSWORD password
```

d. Since LAN Bridge 100 and LAN Bridge 150 models do not support protocol filtering, you must instruct these bridges to filter frames sent to the broadcast address by entering the following commands, where *bridge-id* is the name of the target bridge. If the target bridge is a LAN Bridge 150 that has a password set, you must include PASSWORD and the bridge's password.

```
ELMS> USE bridge-id
ELMS> ADD ADDRESS FF-FF-FF-FF-FF-FF DISPOSITION FILTER
      PASSWORD password
```

3. Locate the segment where the storm originated and resolve the problem.

   a. From the LTM Main Menu, select #2, Node, Type and Multicast Traffic Displays.

   b. From the Node, Type, and Multicast Traffic Displays Menu, select #6, List of Nodes Using Protocol Type. LTM prompts you for a Protocol Type value.

   c. Enter 08-00 or 08-06 to display a list of the nodes using TCP/IP or ARP. LTM displays the addresses of the nodes using the protocol.

   d. Follow the procedure described in the Screaming Node example to find the segment where the broadcast storm originated.

e. Resolve the problem, or at least ensure that it is isolated to a single segment. If the bridge connecting the segment is a LAN Bridge 200 or a DECbridge 500, enter the following commands to ensure that it has the appropriate protocol entries in its protocol database. If it does not, add them as described in step 2c.

```
ELMS> USE bridge-id
ELMS> SHOW PROTOCOL 08-00
ELMS> SHOW PROTOCOL 08-06
```

If the bridge connecting the problem segment is a LAN Bridge 100 or LAN Bridge 150 model, ensure that the bridge has an entry for the broadcast address in its forwarding database:

```
ELMS> USE bridge-id
ELMS> SHOW ADDRESS FF-FF-FF-FF-FF-FF
```

4. Finally, remove any unnecessary protocol or address entries that you added when you were first trying to contain the problem. The following commands remove a protocol entry from the protocol database of a LAN Bridge 200 or a DECbridge 500:

```
ELMS> USE bridge-name
ELMS> REMOVE PROTOCOL 08-00 PASSWORD password
```

The following commands remove an address entry from the forwarding database of a bridge. (You do not need to include the password if the target bridge is a LAN Bridge 100 model or if it does not have a password set.)

```
ELMS> USE bridge-id
ELMS> REMOVE ADDRESS FF-FF-FF-FF-FF-FF PASSWORD password
```

Recommendations

You can take proactive steps to prevent broadcast storms by adding protocol filters to isolate protocols that misuse the broadcast address. Use LTM and DECelms to study the protocols used on each segment in your extended LAN and use filters to contain protocols to the LAN segment where they are used. (You can do the same for multicast addresses also.)

For example, if one segment in an extended LAN supports a classroom full of nodes using AppleTalk, you could add a protocol entry for AppleTalk with the disposition FILTER in the bridge connecting the segment. The filter will prevent the AppleTalk broadcasts from entering the extended LAN, where there are no nodes using AppleTalk. This prevents the broadcasts from taking up valuable network bandwidth and host processing power.

6.6 Bridge Cannot Down-Line Load LTM

Symptoms

A LAN Bridge 100 or a LAN Bridge 150, intended to be used as a LAN Traffic Monitor (LTM) listener, cannot down-line load the LTM image file. (The other bridge models do not support LTM.)

Explanation

The bridge successfully completed its self-test, but cannot down-line load the LTM image because the bridge is improperly configured or there is no properly configured down-line load host active on the network. See Section 2.5.1 for information about configuring a bridge to be an LTM listener.

Troubleshooting Strategy

Follow this strategy to troubleshoot a down-line loading problem:

1. Check that the bridge is properly configured for down-line loading.
2. If necessary, use DECelms to correct the configuration and enable the bridge to down-line load.
3. If the bridge still cannot down-line load, check the down-line load host to ensure that it is properly set up for down-line loading the LTM software.

Troubleshooting Procedure

Follow these steps:

1. If the target bridge is a LAN Bridge 100, ensure that its hardware is at least REV E, the minimum hardware version required for LTM. To check the hardware version:
   - Check the metal tag on the back of the bridge

     or

   - Enter the following DECelms command, where *bridge-id* is the name or address of the target bridge:

     ```
     ELMS> SHOW bridge-id CHARACTERISTICS
     ```

DECelms displays:

```
Show Device Characteristics          As of: 27-APR-1990 11:19:12
Name: bridge-name,                    Address: 08-00-2B-nn-nn-nn

Node ID (root priority/address):                 128 /08-00-2B-0C-1A-A7
Software Implementation Type:                    DEBET
Software Version:                                1.0
Downline Load Switch:                            Disabled
Downline Load File Name:
Downline Load Physical Switch:                   Disabled
ROM Implementation Type:                         N/A
ROM Version:                                     N/A
```

Check the value in the Software Version field of the resulting display. A software version of 2.0 or greater equates to hardware REV E. If the software version is less than 2.0, the bridge cannot serve as an LTM listener.

2. Check that the down-line loading is enabled on the bridge.

   The display of the SHOW CHARACTERISTICS command, shown in step 1, also shows the settings of the hardware and software switches on the bridge that control down-line loading. The Downline Load Switch field shows the setting of the software switch controlled by DECelms. The Downline Load Physical Switch field shows the setting of the hardware switch that controls down-line loading. The Downline Load File Name field shows the software identification of the LTM image file that the bridge will request from the down-line load host, if this information was entered with DECelms.

   For the bridge to down-line load, one of these switches, but not both, must be set to Enabled. The following steps describe how to correct the situation where both switches are set to Disabled or Enabled:

   a. If both the hardware and software Down-Line Load switches are set to Disabled, enter the following DECelms commands to enable down-line loading, where *bridge-id* is the name or address of the target bridge. If the target bridge is a LAN Bridge 150 that has a password set, you must include PASSWORD and the bridge's password.

   ```
   ELMS> USE bridge-id
   ELMS> SET LOAD SWITCH TRUE PASSWORD password
   ```

   b. If both the hardware and software Down-Line Load switches are set to Enabled, either manually disable the hardware switch (push switch number 5 up) or enter the following DECelms commands to disable the software switch, where *bridge-id* is the

name or address of the target bridge. If the target bridge is a LAN Bridge 150 that has a password set, you must include PASSWORD and the bridge's password.

```
ELMS> USE bridge-id
ELMS> SET LOAD SWITCH FALSE PASSWORD password
```

c. Enter the INITIALIZE command to reset the bridge with the new information that you specified. If the target bridge is a LAN Bridge 150 that has a password set, you must include PASSWORD and the bridge's password.

```
ELMS> INITIALIZE PASSWORD password

Command will initialize device bridge-name
After initialization, device bridge-address will be loaded
with image
Do you really want to initialize device bridge-address ? YES
```

The load should take less than 5 minutes, unless the down-line load host is extremely busy.

NOTE

Do **not** use the INITIALIZE WITH DEFAULTS command, because it makes the bridge load itself with the bridge software stored in its read-only memory (ROM) instead of requesting a down-line load of LTM software.

3. If the bridge still does not down-line load, the target bridge may not be defined correctly in the node database of the down-line load host. To ensure that the target bridge is correctly defined, run the Network Control Program (NCP) from the down-line load host and enter the following command, where *bridge-nodename* is the DECnet node name assigned to the bridge:

```
NCP> SHOW NODE bridge-nodename CHARACTERISTICS
```

Verify that the information for the service circuit, bridge address, and LTM down-line load file is correct. If any information is incorrect, use the NCP commands SET NODE and DEFINE NODE to correct it.

4. Enter the following NCP command to check that service is enabled on the circuit for the bridge:

```
NCP> SHOW CIRCUIT circuit-id CHARACTERISTICS
```

If the circuit service is not enabled, use the following NCP commands to enable it:

```
NCP> SET CIRCUIT circuit-id STATE OFF
NCP> SET CIRCUIT circuit-id SERVICE ENABLED
NCP> SET CIRCUIT circuit-id STATE ON
```

The following command is optional. It enables service for the circuit in the NCP permanent database. However, you may not want to permanently enable service for the circuit because of its effect on performance.

```
NCP> DEFINE CIRCUIT circuit-id SERVICE ENABLED
```

5. Make sure that the cabling is connected securely.
6. Try to down-line load the bridge again by entering the following DECelms commands. If the target bridge is a LAN Bridge 150 that has a password set, you must include PASSWORD and the bridge's password.

```
ELMS> USE bridge-id
ELMS> INITIALIZE PASSWORD password

Command will initialize device bridge-name
After initialization, device bridge-address will be loaded
with image
Do you really want to initialize device bridge-address ? YES
```

A

DECelms Event Codes

This appendix describes the event descriptions that the background poller function and device listener function place in the DECelms (DEC Extended LAN Management Software) event log, a binary file. To display the event descriptions from the event log in a readable format or send them to a readable file, use the FORMAT command, described in Section 1.12.4. An event description from the event log follows:

```
Event Logged Time: 27-APR-1990 14:05:28.71
Device Name      : NM_08002B0EDE7A
Device Type      : DEBAM - LAN Bridge 200
Line 1 Address   : 08-00-2B-0E-DE-7A
Line 2 Address   : 08-00-2B-0E-DE-79
Event Code       : 3.1.10
Event Description: Inlink
Previous Value   : 1
Current Value    : 2
```

Each event description includes the name, device type, and addresses of the device that had a state change, the time the background poller function or device listener function detected the event, a code for the event, and a brief description. In most cases, the event description also shows the previous and current values of the attribute. See Section 1.12.1 for more information about the DECelms event log and the generation of event descriptions.

Table A–1 describes the DECelms event descriptions. These descriptions are listed in order by the event codes, the sixth field of the event description. In the preceding example, the event code is 3.1.10. This table contains the following columns:

Event Code	The actual event code that appears in the error log.
Device	The device that returned the event (the first number of the event code indicates the device): 1. DECelms 2. Wiring Concentrator 3. Bridge
Entity	The entity on the device (the second number of the event code indicates the entity): 1. Device (the device itself) 2. FDDI Line or All Lines 3. Physical Port 4. Poller (the DECelms background poller function) 5. Listener (the DECelms device listener function) Note that Table A–1 distinguishes between event codes that apply only to FDDI lines and those that apply to all lines, including FDDI and Ethernet/IEEE 802.3 lines.
Attribute Code Description	The attribute condition change that caused the event, as indicated by the third number in the event code.

See Chapter 5 for a complete description of the counters, characteristics, spanning tree characteristics, and other attributes mentioned in Table A–1.

Table A–1: DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
1.4.1	DECelms	Poller	The LAN Bridge 100 or LAN Bridge 150 has been down-line loaded with LAN Traffic Monitor (LTM) software and is now serving as a LTM listener.

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
1.4.2	DECelms	Poller	The device being polled did not respond within the timeout period.
1.4.3	DECelms	Poller	An already-registered device that was inactive has resumed transmitting.
1.4.4	DECelms	Poller	DECelms obtained additional information from a device that was manually added to the DECelms registry.
1.4.5	DECelms	Poller	The device was initalized, powered down, or reset and then became active again since the last time it was polled. (The background poller function detected that the device's Seconds Operating counter was less than the expected value.)
1.5.1	DECelms	Listener	The LAN Bridge 100 or LAN Bridge 150 has been down-line loaded with LAN Traffic Monitor (LTM) software and is now serving as a LTM listener.
1.5.2	DECelms	Listener	The device listener function detected a new device transmitting on the network, but the device did not respond to requests for additional information.
1.5.3	DECelms	Listener	New LAN Bridge 100 on network.
1.5.4	DECelms	Listener	New LAN Bridge 150 on network.
1.5.5	DECelms	Listener	New LAN Bridge 200 on network.
1.5.6	DECelms	Listener	New DECbridge 500 on network.
1.5.7	DECelms	Listener	New DECconcentrator 500 on network.
1.5.8	DECelms	Listener	The LAN Bridge 100 has been down-line loaded with LAN Traffic Monitor (LTM) software and is now serving as an LTM listener.

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
1.5.9	DECelms	Listener	The LAN Bridge 150 has been down-line loaded with LAN Traffic Monitor (LTM) software and is now serving as an LTM listener.
2.1.1	Wiring Concentrator	Device	The wiring concentrator's non-volatile memory (NVRAM) failed. (For more information, see Table 5–2.)
2.1.2	Wiring Concentrator	Device	The configuration or operational status of the field replaceable units (FRUs) in the wiring concentrator changed. (For more information, see Table 5–2.)
2.1.3	Wiring Concentrator	Device	Unsolicited Resets counter incremented, indicating that the wiring concentrator initialized itself after encountering a fatal error. (For more information, see Table 5–15.)
2.1.4	Wiring Concentrator	Device	Power Ups counter incremented, indicating that the wiring concentrator was powered on. (For more information, see Table 5–15.)
2.1.5	Wiring Concentrator	Device	Management Resets counter incremented, indicating that a DECelms command initialized the wiring concentrator. (For more information, see Table 5–15.)
2.1.6	Wiring Concentrator	Device	Invalid Passwords counter incremented, indicating that the wiring concentrator received a DECelms command with an invalid or missing password. (For more information, see Table 5–15.)
2.2.1	Wiring Concentrator	Line	A new Negotiated Token Rotation Time (the ANSI parameter T_Neg) is in effect on the ring. (For more information, see Table 5–4.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
2.2.2	Wiring Concentrator	Line	The Upstream Neighbor Address (UNA) has changed, indicating a topology change in the ring. (For more information, see Table 5–4.)
2.2.3	Wiring Concentrator	Line	Ring Beaconing Initiated counter incremented, indicating that the wiring concentrator initiated a ring beacon process. (For more information, see Table 5–18.)
2.2.4	Wiring Concentrator	Line	Ring Initialization Received counter incremented, indicating that another station initialized the ring, either by the claim token process or by the ring beacon process. (For more information, see Table 5–18.)
2.2.5	Wiring Concentrator	Line	Ring Initialization Initiated counter incremented, indicating that the wiring concentrator initiated the claim token process. (For more information, see Table 5–18.)
2.2.6	Wiring Concentrator	Line	Duplicate Address Test Failed counter incremented, indicating that the wiring concentrator detected a duplicate of its own address on the ring. (For more information, see Table 5–18.)
2.2.7	Wiring Concentrator	Line	Duplicate Token Detected counter incremented, indicating that the wiring concentrator detected a duplicate token on the ring, either by the duplicate token detected algorithm or by receiving a token while holding a token. (For more information, see Table 5–18.)
2.2.8	Wiring Concentrator	Line	Traces Initiated counter incremented, indicating that the wiring concentrator initiated a PC trace process. (For more information, see Table 5–18.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
2.2.9	Wiring Concentrator	Line	Traces Received counter incremented, indicating that the wiring concentrator initiated a PC trace process because it received a PC trace event. (For more information, see Table 5–18.)
2.2.11	Wiring Concentrator	Line	Ring Purge Error counter incremented, indicating that the station received a token while serving as the ring purger. (For more information, see Table 5–18.)
2.2.12	Wiring Concentrator	Line	Frame Alignment Error counter incremented, indicating that the wiring concentrator received a frame that contained an odd number of symbols; that is, a nonintegral number of octets. (For more information, see Table 5–18.)
2.2.13	Wiring Concentrator	Line	Frame Status Error counter incremented, indicating that the wiring concentrator received a frame that had the E (error detected) indicator set or a missing E indicator. (For more information, see Table 5–18.)
2.3.1	Wiring Concentrator	Physical Port	The operational state of the physical port changed. (For more information, see Table 5–5.)
2.3.2	Wiring Concentrator	Physical Port	The physical port is now connected to a different type of neighbor physical port. (For more information, see Table 5–5.)
2.3.3	Wiring Concentrator	Physical Port	LEM Rejects counter incremented, indicating that the physical port disconnected an active connection because its link error monitor (LEM) threshold was exceeded. (For more information, see Table 5–19.)
2.3.4	Wiring Concentrator	Physical Port	The reason that the last connection on the physical port was lost. (For more information, see Table 5–5.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
2.3.5	Wiring Concentrator	Physical Port	LEM Link Errors counter incremented, indicating that the link error monitor (LEM) on the physical port detected a noise event. (For more information, see Table 5–19.)
2.3.6	Wiring Concentrator	Physical Port	LCT Rejects counter incremented, indicating that the physical port rejected a connection because the Link Confidence Test (LCT) failed. (For more information, see Table 5–19.)
2.3.7	Wiring Concentrator	Physical Port	Connections Completed counter incremented, indicating that the physical port completed the initialization process and established a connection. (For more information, see Table 5–19.)
2.3.8	Wiring Concentrator	Physical Port	TNE Expired Rejects counter incremented, indicating that the physical port terminated a connection because its TNE noise timer expired. (For more information, see Table 5–19.)
2.3.9	Wiring Concentrator	Physical Port	Elasticity Buffer Errors counter incremented, indicating the elasticity buffer in the physical port had an overflow or underflow. (For more information, see Table 5–19.)
3.1.1	Bridge	Device	The bridge's non-volatile memory (NVRAM) failed. (For more information, see Table 5–1.)
3.1.2	Bridge	Device	The configuration or operational status of the field replaceable units (FRUs) in the bridge changed. (For more information, see Table 5–1.)
3.1.3	Bridge	Device	Unsolicited Resets counter incremented, indicating that the bridge initialized itself after encountering a fatal error. (For more information, see Table 5–14.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
3.1.4	Bridge	Device	Power Ups counter incremented, indicating that the bridge was powered on. (For more information, see Table 5–14.)
3.1.5	Bridge	Device	Management Resets counter incremented, indicating that a DECelms command initialized the bridge. (For more information, see Table 5–14.)
3.1.6	Bridge	Device	Invalid Passwords counter incremented, indicating that the bridge received a DECelms command with an invalid or missing password. (For more information, see Table 5–14.)
3.1.8	Bridge	Device	The bridge believes that a different bridge is now serving as the root bridge. (For more information, see Table 5–11.)
3.1.9	Bridge	Device	The bridge's current path cost to the root bridge has changed. (For more information, see Table 5–11.)
3.1.10	Bridge	Device	The bridge's line to the root bridge (inlink) has changed. (For more information, see Table 5–11.)
3.1.11	Bridge	Device	The root bridge received a Topology Change Notification message, indicating that the topology of the network is currently changing. (For more information, see Table 5–11.)
3.1.12	Bridge	Device	The Spanning Tree mode used by the bridge has changed from a LAN Bridge 100 Spanning Tree mode to the 802 Spanning Tree mode or vice versa. (For more information, see Table 5–1.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
3.1.13	Bridge	Device	A new LAN Bridge 100 spanning tree mode-only bridge is being polled by the root bridge. (For more information, see Table 5–1.)
3.1.14	Bridge	Device	Spanning Tree Mode Changes counter incremented, indicating that the Spanning Tree mode being used by the bridge has changed from the LAN Bridge 100 Spanning Tree mode to the 802 Spanning Tree mode or vice versa. (For more information, see Table 5–14.)
3.2.1	Bridge	FDDI Line	A new Negotiated Token Rotation Time (the ANSI parameter T_Neg) is in effect on the ring. (For more information, see Table 5–4.)
3.2.2	Bridge	FDDI Line	The Upstream Neighbor Address (UNA) has changed, indicating a topology change in the ring. (For more information, see Table 5–4.)
3.2.3	Bridge	FDDI Line	Ring Beaconing Initiated counter incremented, indicating that the bridge initiated a ring beacon process. (For more information, see Table 5–17.)
3.2.4	Bridge	FDDI Line	Ring Initialization Received counter incremented, indicating that another station initialized the ring, either by the claim token process or by the ring beacon process. (For more information, see Table 5–17.)
3.2.5	Bridge	FDDI Line	Ring Initialization Initiated counter incremented, indicating that the bridge initiated the claim token process. (For more information, see Table 5–17.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
3.2.6	Bridge	FDDI Line	Duplicate Address Test Failed counter incremented, indicating that the bridge detected a duplicate address on the ring. (For more information, see Table 5–17.)
3.2.7	Bridge	FDDI Line	Duplicate Token Detected counter incremented, indicating that the bridge detected a duplicate token on the ring, either by the duplicate token detected algorithm or by receiving a token while holding a token. (For more information, see Table 5–17.)
3.2.8	Bridge	FDDI Line	Traces Initiated counter incremented, indicating that the bridge initiated a PC trace process. (For more information, see Table 5–17.)
3.2.9	Bridge	FDDI Line	Traces Received counter incremented, indicating that the bridge initiated a PC trace process because it received a PC trace event. (For more information, see Table 5–17.)
3.2.11	Bridge	FDDI Line	Ring Purge Error counter incremented, indicating that the station received a token while serving as the ring purger. (For more information, see Table 5–17.)
3.2.12	Bridge	FDDI Line	Frame Alignment Error counter incremented, indicating that the bridge received a frame that contained an odd number of symbols; that is, a non-integral number of octets. (For more information, see Table 5–17.)
3.2.13	Bridge	FDDI Line	Frame Status Error counter incremented, indicating that the bridge received a frame that had the E (error detected) indicator set or a missing E indicator. (For more information, see Table 5–17.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
3.2.14	Bridge	FDDI Line	Bridge Strip Error counter incremented, indicating that the bridge terminated a bridge strip operation because it received a token. (For more information, see Table 5–17.)
3.2.15	Bridge	FDDI Line	Unprocessed Error Packets counter incremented, indictating that the bridge received a frame that contained an error but did not have time to decipher it. (For more information, see Table 5–17.)
3.2.16	Bridge	Line	The reason that the Local Network Module (LNM) State is BROKEN, or the reason for the last line failure. (For more information, see Table 5–3.)
3.2.17	Bridge	Line	The designated bridge on this line has changed. The designated bridge is the bridge on the path to the root bridge. (For more information, see Table 5–13.)
3.2.18	Bridge	Line	Port Restarts counter incremented, indicating that the bridge restarted one of its lines. (For more information, see Table 5–16.)
3.2.19	Bridge	Line	Receive Overrun counter incremented, indicating that the bridge received a frame loss indication from the hardware on the line. (For more information, see Table 5–16.)
3.2.20	Bridge	Line	Bad Hello Limit Exceeded counter incremented, indicating that the number of bad Hello messages received on the line exceeded the Bad Hello Limit set for the bridge. (For more information, see Table 5–16.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
3.3.1	Bridge	Physical Port	The operational state of the physical port changed. (For more information, see Table 5–5.)
3.3.2	Bridge	Physical Port	The physical port is now connected to a different type of neighbor physical port. (For more information, see Table 5–5.)
3.3.3	Bridge	Physical Port	LEM Rejects counter incremented, indicating that the physical port disconnected an active connection because its link error monitor (LEM) threshold was exceeded. (For more information, see Table 5–19.)
3.3.4	Bridge	Physical Port	The reason that the last connection on the physical port was lost. (For more information, see Table 5–5.)
3.3.5	Bridge	Physical Port	LEM Link Errors counter incremented, indicating that the link error monitor (LEM) on the physical port detected a noise event. (For more information, see Table 5–19.)
3.3.6	Bridge	Physical Port	LCT Rejects counter incremented, indicating that the physical port rejected a connection because the link confidence test (LCT) failed. (For more information, see Table 5–19.)
3.3.7	Bridge	Physical Port	Connections Completed counter incremented, indicating that the physical port completed the initialization process and established a connection. (For more information, see Table 5–19.)
3.3.8	Bridge	Physical Port	TNE Expired Rejects counter incremented, indicating that the physical port terminated a connection because its TNE noise timer expired. (For more information, see Table 5–19.)

Table A–1 (Cont.): DECelms Event Codes

Event Code	Device	Entity	Attribute Code Description
3.3.9	Bridge	Physical Port	Elasticity Buffer Errors counter incremented, indicating the elasticity buffer in the physical port had an overflow or underflow. (For more information, see Table 5–19.)

B

DECelms Error and Informational Messages

This appendix contains an alphabetical list of the DECelms (DEC Extended LAN Management Software) error and informational messages. There are two kinds of messages:

1. Error messages followed by the corrective action you can take.
2. Informational messages that do not require corrective action.

A zero device address was entered.
Please type command again with a legal address.

> **Explanation:** You did not specify a device name, device address, KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES after the command verb or in a previous USE command.
>
> **User Action:** Enter a USE command to specify the target entity or include the name or address of the target entity directly after the command verb.

Acquiring data - keyboard temporarily locked.

> **Explanation:** After you enter the SHOW ADDRESSES command, DECelms temporarily locks the keyboard while it reads the address entries into the display. This may take several seconds, since the forwarding database of a bridge can hold thousands of address entries. Any commands that you enter while the keyboard is locked are executed once keyboard action resumes, except for $\boxed{\text{Ctrl/Y}}$, which imme-

diately terminates DECelms and returns you to the DCL prompt. DECelms displays a message when keyboard action resumes.

User Action: Wait until DECelms displays the message indicating that keyboard action has resumed, or press Ctrl/Y to terminate DECelms and return to the DCL prompt.

After initialization, device *bridge-address* will be loaded
from the responding node's NCP database
with image *down-line-load-file-name.*

Explanation: An informational message stating that the bridge with the given address has its Down-Line Load hardware or software switch set to True, so that it will request a down-line load of the file indicated when initialization is complete.

After initialization, Device *bridge-address* will come on line as a bridge.

Explanation: An informational message stating that the bridge with the given address has its Down-Line Load software switch and its Down-Line Load hardware switch set to False, so that it will load the bridge software stored in its NVRAM. The bridge is currently serving as a LAN Traffic Monitor (LTM) listener.

After initialization, LAN Traffic Monitor *bridge-address* will be loaded
from the responding node's NCP database
with image *down-line-load-file-name.*

Explanation: An informational message stating that the bridge with the given name and address has its Down-Line Load hardware or software switch set to True, so that it will request a down-line load of the file indicated when initialization is complete. The bridge is currently serving as a LAN Traffic Monitor (LTM) listener.

After initialization LAN Traffic Monitor *bridge-address* will come online
as a bridge.

Explanation: An informational message stating that the bridge with the given address has its Down-Line Load software switch and its Down-Line Load hardware switch set to False, so that it will serve as a bridge again when initialization is complete. The bridge was previously serving as a LAN Traffic Monitor (LTM) listener. DECelms displays this message after the bridge receives the SET LOAD SWITCH FALSE and INITIALIZE commands.

After initialization LAN Traffic Monitor *bridge-address*
will come online as a LAN Bridge.

Explanation: An informational message stating that the bridge with the given address has its Down-Line Load software switch set to False, so that it will serve as a bridge again when initialization is complete. The bridge was previously serving as a LAN Traffic Monitor (LTM) listener. DECelms displays this message after the bridge receives the SET LOAD SWITCH FALSE and INITIALIZE commands.

All network channels in NIMUX are busy. Please try later.

Explanation: The maximum number of users are currently using DECelms.

User Action: Try again later or ask another user to exit.

Bad status returned from SYS$ASCTIM.

Explanation: A system time request failed.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

BCP cannot create its mailbox.
Check that BCP is in an account with the proper privileges.

Explanation: You are trying to use DECelms from an account that does not have the TMPMBX privilege.

User Action: Ensure that the TMPMBX privilege is assigned to your account or use DECelms from an account that has the TMPMBX privilege.

BCP cannot find mailbox just created.

Explanation: A system error disrupted the mailbox that the Bridge Control Program (BCP) needs to communicate with the DECelms network multiplexer process, ELMS$NIMUXPRC.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

BCPACT - error in message parsing.

Explanation: DECelms encountered an error in parsing a message returned from a device. There may be a problem with DECelms, the device, or the network.

User Action: Reenter the command. If it fails again, check the status of the device and the network.

BMD error: directory could not be open 1.

Explanation: DECelms encountered an internal error.

User Action: Enter SYS$COMMON:[SYSMGR]ELMS$SHUTDOWN to stop DECelms. Ensure that the two files shown below have W:RW file protection. The files are located in SYS$COMMON:[ELMS$DIRECTORY].

ELMS$DATABASE.DNE
ELMS$DATABASE.DSE

Enter @SYS$STARTUP:ELMS$STARTUP to restart DECelms. If the error persists, contact your Digital customer service representative.

BMD error: directory could not be open 2.

Explanation: You attempted to add an already-present device entry to the DECelms registry.

User Action: Use the MODIFY command to modify an existing registry entry or use the DELETE command to remove the entry.

BMD error: directory could not be open 3.

Explanation: The logical name for the DECelms registry, ELMS$HOME, contains an invalid device specification. Alternatively, the device specified in the logical name, ELMS$HOME, is not present.

User Action: Check that the device specification in the logical name ELMS$HOME is SYS$SYSDEVICE. Enter SHOW DEVICE to see if SYS$SYSDEVICE is present. If not, contact the system administrator.

BMD error: directory could not be open 4.

Explanation: The directory for the DECelms registry was not created during installation. Alternatively, the logical name defining the directory for the DECelms registry, ELMS$HOME, is not present.

User Action: Check that the directory SYS$COMMON:[ELMS$DIRECTORY] is present. If it is not, reinstall DECelms. If the directory is present, check the logical name ELMS$HOME.

BMD error: directory could not be open 5.

Explanation: You entered the LIST, MODIFY, or DELETE command for a device entry that is not present in the DECelms registry.

User Action: If desired, use the REGISTER command to add an entry for the device in the DECelms registry.

BMD error: directory could not be open 6.

Explanation: You cannot add information to the DECelms registry because the disk is full.

User Action: Create more disk space on the disk where the DECelms registry is stored.

BMD error: directory could not be open 8.

Explanation: You attempted to add a description of more than 80 characters when using the REGISTER or MODIFY command to add or modify a device entry in the DECelms registry. DECelms truncated the extra characters.

User Action: If desired, use the MODIFY command to enter a new description of 80 characters or less for the entry.

BMD error: directory could not be open 9.

Explanation: The files that make up the DECelms registry were not created during installation or were subsequently destroyed.

User Action: Check that the two files shown below are present in SYS$COMMON:[ELMS$DIRECTORY]. If these files are not present, reinstall DECelms.

ELMS$DATABASE.DNE
ELMS$DATABASE.DSE

BMD error: directory could not be open 10.

Explanation: The files that make up the DECelms registry do not have W:RW file protection. This happens when the person installing DECelms does not run the Installation Verification Procedure (IVP) after installing DECelms. In that case, the DECelms registry files take on the default file protection of the first person who uses DECelms.

User Action: Ensure that the two files shown below have W:RW file protection. The files are located in SYS$COMMON:[ELMS$DIRECTORY].

```
ELMS$DATABASE.DNE
ELMS$DATABASE.DSE
```

BMD error: directory could not be open 11.

Explanation: The logical name for the DECelms registry, ELMS$HOME, contains invalid file specifications. Alternatively, the files that comprise the DECelms registry do not exist.

User Action: First, check that the logical name for the DECelms registry, ELMS$HOME, contains file specifications for the directory and files listed below. Then, check that the files listed below are present on the system. The files are located in SYS$COMMON:[ELMS$DIRECTORY]. If these files are not present, reinstall DECelms.

```
ELMS$DATABASE.DNE
ELMS$DATABASE.DSE
```

BMD error: directory could not be open 12.

Explanation: You attempted to assign a device name longer than 31 characters for a device entry in the DECelms registry.

User Action: Assign a device name of 31 characters or less.

BMD error: directory could not be open 13.

Explanation: The polling information associated with a DECelms registry entry is not present, preventing DECelms from polling the device.

User Action: Use the DELETE command to remove each registry entry that caused the error. Use the REGISTER command to add a new entry for each device.

BMD error: directory could not be open 17.

Explanation: The polling information associated with a DECelms registry entry is not present, preventing DECelms from polling the device.

User Action: Use the DELETE command to remove each registry entry that caused the error. Use the REGISTER command to add a new entry for each device.

BMD error: directory could not be open 20.

Explanation: An informational message indicating that ELMS$NIMUXPRC started for the first time and created the DECelms registry.

Bridge Line Monitor cannot operate on this type of bridge.

Explanation: You entered the MONITOR command with a device other than a LAN Bridge 200 as the command domain. The LAN Bridge 200 Line Monitor functionality is available only on a LAN Bridge 200 line.

User Action: Reenter the command with a LAN Bridge 200 line as the command domain.

Bridge Type incorrect for this command.

Explanation: You entered a command that does not apply to the target bridge.

User Action: Enter a command that is appropriate for the target bridge.

Call status of SYS$GETMSG not normal: *status*.

Explanation: DECelms encountered a system error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Call status of SYS$GETMSG not normal (may have been called with 0).

Explanation: DECelms encountered a system error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Cannot assign channel to mailbox.
Please determine if mailboxes are available.

Explanation: ELMS$NIMUXPRC, the DECelms network multiplexer process, is not running, possibly because the DECelms user has insufficient account quotas.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, adjust the account quotas of the person trying to use DECelms, as described in the *DECelms Installation* manual. If that does not work, contact your Digital customer service representative.

Command is for device *device-name.*

Explanation: An informational message stating that your command was sent to the named device. When KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES is the command domain, DECelms repeats this message serially as it sends the command to each appropriate device listed in the DECelms registry.

Command not recognized.

Explanation: You entered an invalid command.

User Action: Reenter the command, ensuring that you are using the correct syntax.

Command sent to device *device-name.*

Explanation: An informational message stating that your command was sent to the named device. When KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES is the command domain, DECelms repeats this message serially as it sends the command to each appropriate device listed in the DECelms registry.

Command will initialize device *device-name*.

Explanation: An informational message displayed by DECelms after you enter the INITIALIZE command. DECelms follows this message with a confirmation prompt. Enter YES to initialize the device.

Command will initialize device *device-name* with defaults.

Explanation: An informational message displayed by DECelms after you enter the INITIALIZE WITH DEFAULTS command. DECelms follows this message with a confirmation prompt. Enter YES to initialize the device with default parameter values.

Contents of parse table file were bad.

Explanation: The file ELMS$BCPPRS.BIN is corrupted. This file is located in SYS$COMMON:[SYSEXE].

User Action: Investigate the cause of the file corruption and, if necessary, reinstall DECelms.

Could not assign channel to terminal.

Explanation: The Bridge Control Program (BCP) is unable to assign a channel to your terminal.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Could not open command file *file-name*.

Explanation: DECelms could not find the command file you specified.

User Action: Ensure that the command file is in the current default directory. Reenter the command, being sure to type the file name correctly.

Could not open the parse table file.

Explanation: The Bridge Control Program (BCP) cannot open the parse table file, ELMS$BCPPRS.BIN. The parse table file is missing or has incorrect file protection.

User Action: Check to see if ELMS$BCPPRS.BIN is present in SYS$COMMON:[SYSEXE] and properly protected. If it is not present, reinstall DECelms.

Could not read parse table file.

Explanation: The Bridge Control Program (BCP) could not read from the parse table file, ELMS$BCPPRS.BIN, either because the parse table file is corrupted or because of a read error. The parse table file is located in SYS$COMMON:[SYSEXE].

User Action: Reenter the command. If the error recurs, reinstall DECelms.

Data acquired - keyboard action resumed.

Explanation: An informational message stating that your keyboard is reactivated. DECelms locks the keyboard while it is reading in address entries in response to the SHOW ADDRESSES command.

Device name too long - more than 31 characters.

Explanation: You attempted to assign a name longer than 31 characters for a device entry in the DECelms registry.

User Action: Assign a device name of 31 characters or less.

Device Type incorrect for this command.

Explanation: You entered a command that does not apply to the target device.

User Action: Enter a command that is appropriate for the target device.

Device Type incorrect for protocol operations.

Explanation: You entered a protocol command for a device other than a LAN Bridge 200 or a DECbridge 500.

User Action: Enter protocol commands only when a LAN Bridge 200 or a DECbridge 500 is the command domain.

Directory not found.

Explanation: The directory for the DECelms registry was not created during installation. Alternatively, the logical name defining the directory for the DECelms registry, ELMS$HOME, is not present.

User Action: Check that the directory SYS$COMMON:[ELMS$DIRECTORY] is present. If it is not, reinstall DECelms. If the directory is present, check the logical name ELMS$HOME.

DISABLE PORT command has been sent to the bridge.

Explanation: An informational message indicating that DECelms sent the DISABLE command to the target bridge, instructing it to disable the specified line.

DISABLE PORT command will cause the device to be initialized.

Explanation: An informational message displayed by DECelms after you enter the DISABLE command to disable a line on a LAN Bridge 100 or a LAN Bridge 150. DECelms follows this message with a confirmation prompt, asking if you really want to initialize the bridge.

User Action: Enter YES to disable the line and initialize the bridge or NO to terminate the command.

Duplicate device entry.

Explanation: You attempted to add an already-present device entry to the DECelms registry.

User Action: Use the MODIFY command to modify an existing registry entry or use the DELETE command to remove the entry.

ENABLE PORT command has been sent to the bridge.

Explanation: An informational message displayed by DECelms to inform you that the ENABLE message was sent to the specified device.

ENABLE PORT command will cause the device to be initialized.

Explanation: An information message displayed by DECelms after you enter the ENABLE command on a device other than the LAN Bridge 200 or the DECbridge 500. DECelms follows this message with a confirmation prompt.

User Action: Enter YES to carry out the command or NO to terminate it.

Entry not found in ELMS registry.

Explanation: You attempted to modify or remove a device entry that is not present in the DECelms registry.

User Action: If desired, use the REGISTER command to add an entry for the device in the DECelms registry.

Error # 2 returned from device *device-address* as of *date-and-time*
The error that occurred was: More data.
The problem parameter was type code *code*.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Error # 3 returned from device *device-address* as of *date-and-time*
The error that occurred was: Partial success, information not set in NVRAM.
The problem parameter was type code *code*.

Explanation: DECelms entered the information you specified only in the device's volatile memory, because the device's nonvolatile memory (NVRAM) is full.

User Action: If desired, create more room in the device's NVRAM by deleting unused address and protocol entries. Then, delete and reenter the information that caused this message.

Error # 123 returned from device *device-address* as of *date-and-time.*
The error that occurred was: Undefined return code
The problem parameter was type code *code*.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Error # 128 returned from device *device-address* as of *date-and-time*
The error that occurred was: Unrecognized function.
The problem parameter was type code *code*.

Explanation: Your command requested a function that is not supported by the target device.

User Action: Enter only commands that are supported by the target device.

Error # 129 returned from device *device-address* as of *date-and-time*
The error that occurred was: Unrecognized option.
The problem parameter was type code *code*.

Explanation: Your command contained an option that is not supported by the target device.

User Action: Enter only those options that are supported by the target device.

Error # 130 returned from device *device-address* as of *date-and-time*
The error that occurred was: Unrecognized entity.
The problem parameter was type code *code*.

Explanation: Your command involves an entity that is not present on the target device.

User Action: Enter only those commands that involve entities present on the target device.

Error # 131 returned from device *device-address* as of *date-and-time*
The error that occurred was: Unrecognized action.
The problem parameter was type code *code*.

Explanation: Your command requested an action that is not supported by the target device.

User Action: Do not request actions that are not supported by the target device.

Error # 132 returned from device *device-address* as of *date-and-time*
The error that occurred was: Unrecognized parameter type.
The problem parameter was type code *code*.

Explanation: The target device does not recognize the parameter type contained in your command.

User Action: Enter only parameter types that apply to the target device.

Error # 133 returned from device *device-address* as of *date-and-time*
The error that occurred was: Invalid parameter value.
The problem parameter was type code *code*.

Explanation: You entered an address or protocol command for an address or protocol entry that is not present in the target device. Alternatively, you tried to set an address or protocol entry to its existing disposition.

User Action: If desired, use the ADD ADDRESS or ADD PROTOCOL command to add an entry for the address or protocol.

Error # 134 returned from device *device-address* as of *date-and-time*
The error that occurred was: Nonexistent parameter.
The problem parameter was type code *code*.

Explanation: Your command involves an address or protocol entry that is not present in the target device.

User Action: If desired, use the ADD ADDRESS or ADD PROTOCOL command to add an entry for the address or protocol.

Error #135 returned from device *device-address* as of *date-and-time*
The error that occurred was: Parameter already exists.
The problem parameter was type code *code*.

Explanation: You tried to add an existing address or protocol entry to the forwarding database or protocol database of a device.

User Action: Use the SET ADDRESS or SET PROTOCOL command to modify an existing address or protocol entry, or use the REMOVE ADDRESS or REMOVE PROTOCOL command to remove the entry.

Error # 137 returned from device *device-address* as of *date-and-time*
The error that occurred was: Management Switch turned off on Data Link.
The problem parameter was type code *code*.

Explanation: The Management Sets Allowed hardware switch is disabled on one or both of the device's lines, preventing the use of DECelms commands that alter the device's characteristics and the down-line loading of software and firmware.

User Action: Set the Management Sets Allowed hardware switch on the device to enabled.

Error # 138 returned from device *device-address* as of *date-and-time*
The error that occurred was: Invalid length field.
The problem parameter was type code *code*.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Error # 139 returned from device *device-address* as of *date-and-time*
The error that occurred was: Invalid fixed value.
The problem parameter was type code *code*.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Error # 140 returned from device *device-address* as of *date-and-time*
The error that occurred was: Unexpected parameter.
The problem parameter was type code *code*.

Explanation: The target device does not recognize the parameter type contained in your command.

User Action: Enter only parameter types that apply to the target device.

Error # 141 returned from device *device-address* as of *date-and-time*
The error that occurred was: Invalid pdu.
The problem parameter was type code *code*.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Error # 142 returned from device *device-address* as of *date-and-time*
The error that occurred was: Inappropriate parameter value.
The problem parameter was type code *code*.

Explanation: The parameter value contained in your command is inappropriate for the target device.

User Action: Enter parameter values within the legal range for the target device.

Error # 143 returned from device *device-address* as of *date-and-time*
The error that occurred was: Invalid Request ID.
The problem parameter was type code *code*.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Error # 144 returned from device *device-address* as of *date-and-time*
The error that occurred was: Invalid Password.
The problem parameter was type code *code*.

Explanation: The password contained in your command (if any) does not match the one stored in the target device.

User Action: Include PASSWORD and the password of the target device in your command.

Error decoding the device response.

Explanation: DECelms was unable to interpret the device's response.

User Action: Renter the command.

ERROR - Device no longer in DECelms database.

Explanation: The event log that you are displaying with the FORMAT command contains an event description from a device that is no longer listed in the DECelms registry. DECelms displays the event logged time, event code, event description, previous value, and current value. However, DECelms does not display the device name, device type, or addresses because it cannot obtain that information from the DECelms registry.

User Action: If desired, use the REGISTER command to add the missing device to the DECelms registry, and then reenter the FORMAT command.

Error in assigning channel to *tt*.

Explanation: DECelms cannot assign a channel to your terminal for input and output.

User Action: Call your Digital customer service representative.

Error in decoding the set device command response.

Explanation: DECelms was unable to interpret the device's response to a SET command.

User Action: Use the appropriate SHOW command to display the value of the parameter that you tried to set. See if your command had the desired effect on the target device. If not, reenter the command.

Error in decoding the set command response from device.

Explanation: DECelms was unable to interpret the device's response to a SET command.

User Action: Use the appropriate SHOW command to display the value of the parameter that you tried to set. See if your command had the desired effect on the target device. If not, reenter the command.

Error in decoding the set device response.

Explanation: DECelms was unable to interpret the device's response to a SET command.

User Action: Use the appropriate SHOW command to display the value of the parameter that you tried to set. See if your command had the desired effect on the target device. If not, reenter the command.

Error in obtaining a record from the event log file.

Explanation: DECelms is unable to read one or more of the event descriptions in the event log that you are trying to display with the FORMAT command.

User Action: Ensure that the event log file that you are trying to display is present, properly protected, and sound. By default, FORMAT displays the current event log file, SYS$COMMON:[ELMS$DIRECTORY]ELMS$STATE_CHANGE.LOG.

Error in parsing reply to REMOVE request.

Explanation: DECelms was unable to interpret the bridge's response to a REMOVE ADDRESS or REMOVE PROTOCOL command.

User Action: Use the SHOW ADDRESS or SHOW PROTOCOL command to see if your command had the desired effect on the target bridge. If not, reenter the command.

Error in parsing the add forwarding response from bridge.

Explanation: DECelms was unable to interpret the bridge's response to an ADD ADDRESS command.

User Action: Use the SHOW ADDRESS command to see if your command had the desired effect on the forwarding database of the target bridge. If not, reenter the command.

Error in parsing the read forwarding all response.

Explanation: DECelms was unable to interpret the bridge's response to a SHOW ADDRESSES command.

User Action: Reenter the command.

Error in parsing the read forwarding response.

Explanation: DECelms was unable to interpret the bridge's response to a SHOW ADDRESS command.

User Action: Reenter the command.

Error in parsing the set forwarding response from bridge.

Explanation: DECelms was unable to interpret the bridge's response to a SET ADDRESS command.

User Action: Enter the SHOW ADDRESS command to see if your command had the desired effect on the address entry in the bridge. If not, reenter the command.

Error in reading process identifier *identifier*
Check that account has the proper privileges.

Explanation: The Bridge Control Program (BCP) encountered a system error. The person attempting to use DECelms may have insufficient account quotas.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, adjust the account quotas of the person trying to use DECelms, as described in the *DECelms Installation* manual. If that does not work, contact your Digital customer service representative.

Error in reading text for output displays.

Explanation: DECelms could not find or open the file that contains the DECelms displays.

User Action: Check that the following file is present and properly protected: SYS$COMMON:[SYSEXE]ELMS$DISPLAYS.BIN. If necessary change the file protection so that DECelms can open the file. If the file is not present in the directory listed above, move it there or reinstall DECelms.

Error in setting timer.

Explanation: A Bridge Control Program (BCP) or DECelms network multiplexer process (NIMUX) call to SYS$SETIMR did not return SS$NORMAL.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Error in writing to NIMUX mailbox.
Please make sure ELMS$NIMUXPRC is running.

Explanation: The process, ELMS$NIMUXPRC has stopped.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP to restart the process. If that does not work, contact your Digital customer service representative.

Error in writing to NIMUX's mailbox.

Explanation: The process, ELMS$NIMUXPRC has stopped.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP to restart the process.

ERROR - No Records Qualify.

Explanation: The event log that you are trying to display with the FORMAT command contains no events that meet your specifications. For example, you may have used the SINCE phrase to display the events that occurred after a certain time, but the file contained no events generated after the given time.

Error opening event log input file.

Explanation: DECelms could not open the event log file that you tried to display with the FORMAT command.

User Action: Make sure that you typed the file name correctly. Check that the log file that you tried to display is present and properly protected. The default log file used by the FORMAT command is the current event log file,
SYS$COMMON:[ELMS$DIRECTORY]ELMS$STATE_CHANGE.LOG.

Error translating time to system binary format.

Explanation: A Bridge Control Program (BCP) call to SYS$BINTIM did not return SS$NORMAL.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Fatal error entering read from NIMUX mailbox.

Explanation: The Bridge Control Program (BCP) cannot read its mailbox because of a system error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Fatal error in writing to mailbox.
Please restart DECelms.

Explanation: The Bridge Control Program (BCP) cannot write to its mailbox because of a system error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Fatal error - NIMUX did not reply.

Explanation: The DECelms network multiplexer process, NIMUX, has stopped. Alternatively, the maximum number of DECelms users is exceeded.

User Action: Enter SHOW SYSTEM at the DCL prompt to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP to restart the process.
If ELMS$NIMUXPRC is running, try using DECelms again after some of the other users have exited.

Fatal error starting read from mailbox.

Explanation: The Bridge Control Program (BCP) cannot read its mailbox because of a system error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Fatal error starting read from mailbox.
Please restart DECelms.

Explanation: The Bridge Control Program (BCP) cannot read its mailbox because of a system error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

File specification syntax error.

Explanation: There is an error in the file specifications of the files that comprise the DECelms registry.

User Action: Check the file specifications of the files listed below. The files are located in SYS$COMMON:[ELMS$DIRECTORY]. If these files are not present, reinstall DECelms.

ELMS$DATABASE.DNE
ELMS$DATABASE.DSE

Identification string was truncated to 80 characters.

Explanation: You attempted to add a description of more than 80 characters when using the REGISTER or MODIFY command to add or modify a device entry in the DECelms registry. DECelms truncated the extra characters.

User Action: If desired, use the MODIFY command to enter a new description of 80 characters or less for the entry.

Illegal character after the number.

Explanation: When entering an address or a protocol code in a DECelms command, you entered a character other than a hyphen between the sets of numbers.

User Action: Reenter the command, using hyphens to separate the sets of numbers in the address or protocol code.

Illegal command syntax.

Explanation: You entered illegal syntax for a DECelms command.

User Action: Reenter the command with the correct syntax.

Illegal command syntax for the ADD command.

Explanation: You entered illegal syntax for one of the ADD commands.

User Action: Reenter the command with the correct syntax.

Illegal domain for registry.

Explanation: You entered a command that is inappropriate for a DECelms registry entry.

User Action: Use only the REGISTER, MODIFY, DELETE, and LIST command when a DECelms registry entry is the command domain.

Illegal input to CHAR_TO_ASC routine: *value*.

Explanation: DECelms encountered an internal error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Illegal parameter for message type.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Illegal SHOW PHY PORT variation.

Explanation: You entered a SHOW command that is inappropriate when a physical port is the command domain.

User Action: Enter only SHOW STATUS, SHOW CHARACTERISTICS, or SHOW COUNTERS when a physical port is the command domain.

Illegal syntax for the ADD command.

Explanation: You entered illegal syntax for one of the ADD commands.

User Action: Reenter the command with the correct syntax.

Illegal syntax for Show Protocol.

Explanation: You entered illegal syntax for the SHOW PROTOCOL command.

User Action: Reenter the command with the correct syntax.

Illegal syntax for the SET command.

Explanation: You entered illegal syntax for one of the SET commands.

User Action: Reenter the command with the correct syntax.

Illegal syntax for this command.

Explanation: You entered illegal syntax for a DECelms command.

User Action: Reenter the command with the correct syntax.

Incorrect syntax for time. Please reenter.

Explanation: You entered an incorrect time value for the SINCE phrase of the FORMAT command.

User Action: Enter a valid date for the time value in the form *dd-mmm-yyyy hh:mm*. *hh:mm* is optional.

INITIALIZATION message has been sent to the bridge.

Explanation: An informational message stating that DECelms has sent your INITIALIZE command to the target device.

Initialize request will not be sent to device *device-address*.

Explanation: An informational message caused by your NO response to the confirmation prompt that DECelms displays after receiving an INITIALIZE command.

INITIALIZE WITH DEFAULTS message has been sent to the bridge.

Explanation: An informational message stating that DECelms has sent your INITIALIZE WITH DEFAULTS command to the target device.

Insufficient privileges.

Explanation: The files that make up the DECelms registry do not have W:RW file protection. This happens when the person installing DECelms does not run the Installation Verification Procedure (IVP) after installing DECelms. In that case, the DECelms registry files take on the default file protection of the first person who uses DECelms.

User Action: Ensure that the two files shown below have W:RW file protection. The files are located in SYS$COMMON:[ELMS$DIRECTORY].

ELMS$DATABASE.DNE
ELMS$DATABASE.DSE

Monitor disruption: Selected device was restarted.
Please restart monitor.

Explanation: The bridge on which you were running the LAN Bridge 200 Line Monitor was initialized or powered up, disrupting the monitoring function.

User Action: To resume monitoring, reenter the MONITOR command that started the LAN Bridge 200 Line Monitor.

Monitor lost connection to device while reading bridge.

Explanation: DECelms lost the network connection to the bridge on which you were running the LAN Bridge 200 Line Monitor.

User Action: To resume monitoring, reenter the MONITOR command that started the LAN Bridge 200 Line Monitor.

Monitor lost connection to device while reading port.

Explanation: DECelms lost the network connection to the bridge on which you were running the LAN Bridge 200 Line Monitor.

User Action: To resume monitoring, reenter the MONITOR command that started the LAN Bridge 200 Line Monitor.

NIMUX did not reply.

Explanation: The process, ELMS$NIMUXPRC has stopped.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

NIMUX Version number incorrect.

Explanation: You reinstalled DECelms while ELMS$NIMUXPRC, the DECelms network multiplexer process, was still running. As a result the version number of the new Bridge Control Program (BCP) does not match the version number of the existing NIMUX process.

User Action: First, enter @SYS$COMMON:[SYSMGR]ELMS$SHUTDOWN to stop DECelms. Then, perform a complete installation procedure, as described in the *DECelms Installation* guide.

No Device address was specified.

Explanation: You did not specify a device name, device address, KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES after the command verb or in a previous USE command.

User Action: Enter a USE command to specify a target entity or indicate the target entity directly after the command verb.

No device identifier was specified.

Explanation: You did not specify a device name, device address, KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES after the command verb or in a previous USE command.

User Action: Enter a USE command to specify a target entity or indicate the target entity directly after the command verb.

No domain given for REMOVE command.

Explanation: You did not specify a device name, device address, KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES directly after REMOVE, the command verb, or in a previous USE command.

User Action: Enter a USE command to specify a target entity or indicate the target entity directly after REMOVE, the command verb.

No registry found.

Explanation: The files that make up the DECelms registry were not created during installation or were subsequently destroyed.

User Action: Check that the two files shown below are present in SYS$COMMON:[ELMS$DIRECTORY]. If these files are not present, reinstall DECelms.

ELMS$DATABASE.DNE
ELMS$DATABASE.DSE

No service entry.

Explanation: The polling information associated with a DECelms registry entry is not present, preventing DECelms from polling the device.

User Action: Use the DELETE command to remove each registry entry that caused the error. Use the REGISTER command to add a new entry for each device.

Non-existent device name.

Explanation: The device for the DECelms registry does not exist or has an invalid device specification.

User Action: Check SYS$SYSDEVICE, the device specification in the logical names defined for DECelms. If necessary, reinstall DECelms.

NVRAM failed to pass self-test upon power-up or reset.

Explanation: A message returned by a device indicating that the device's nonvolatile memory (NVRAM) failed its self test after the device was initialized or powered up.

User Action: Call your Digital customer service representative to repair the faulty hardware.

Parameter code not found.

Explanation: The protocol value that you attempted to display with the SHOW PROTOCOL command is not present in the protocol database of the target bridge.

User Action: If desired, use the ADD PROTOCOL command to add an entry for the protocol value.

Parse error, error occurred at :

Explanation: You entered a DECelms command with illegal syntax. The arrow points at the incorrect parameter.

User Action: Reenter the command with the correct syntax.

Parse table buffer was too small
nnnnn bytes needed.

Explanation: An installation error indicating that there is a mismatch between the DECelms version and the parse table (ELMS$BCPPRS.BIN) version.

User Action: Delete all the DECelms files and reinstall DECelms, as described in the *DECelms Installation* guide.

Parse table contents are bad.

Explanation: The DECelms parse table, ELMS$BCPPRS.BIN, is corrupt.

User Action: Delete all the DECelms files and reinstall DECelms, as described in the *DECelms Installation* guide.

Parse table version was incorrect.

Explanation: An installation error indicating that there is a mismatch between the DECelms version and the parse table (ELMS$BCPPRS.BIN) version.

User Action: Delete all the DECelms files and reinstall DECelms, as described in the *DECelms Installation* guide.

Periodic display is legal for MONITOR and COUNTERS only.

Explanation: You entered the EVERY *nn* SECONDS or EVERY *nn* MINUTES phrase for a command other than SHOW COUNTERS or MONITOR.

User Action: Enter the EVERY phrase only with the SHOW COUNTERS or MONITOR command.

Phy Port displays not appropriate for *device-address*.

Explanation: You attempted to display the status, characteristics, or counters of a physical port on a device other than a DECbridge 500 or a DECconcentrator 500. These are the only devices that have physical ports.

User Action: Reenter the command, ensuring that the command domain is a physical port on a DECbridge 500 or a DECconcentrator 500.

Press RETURN to stop the display of counters to the file.

Explanation: An informational message displayed by DECelms after you enter SHOW COUNTERS TO *file-name*.

User Action: Press Return to terminate the writing of counter values to the file.

Process already started.

Explanation: You entered a START POLLER command when the background poller function was already running or a START LISTENER command when the device listener function was already running.

Process already stopped.

Explanation: You entered a STOP POLLER command when the background poller function was inactive or a STOP LISTENER command when the device listener function was inactive.

Protocol is in use. Try again later.

Explanation: RBMS is running. Alternatively, the background poller function or another DECelms user is trying to communicate with the same device you are trying to access.

User Action: Enter SHOW SYSTEM at the DCL prompt to see if the process NMS_RBMS$BML is running. If it is, enter @SYS$COMMON:[SYSMGR]NMS_RBMS$SHUTDOWN.COM. In any case, reenter the DECelms command that caused the error message.

Protocol parameters not found in message.

Explanation: DECelms cannot interpret the target device's response to your command.

User Action: Reenter the command.

Registry already exists.

Explanation: DECelms encountered an internal error.

User Action: Enter SYS$COMMON:[SYSMGR]ELMS$SHUTDOWN to stop DECelms. Ensure that the two files shown below have W:RW file protection. The files are located in SYS$COMMON:[ELMS$DIRECTORY].

ELMS$DATABASE.DNE
ELMS$DATABASE.DSE

Enter @SYS$STARTUP:ELMS$STARTUP to restart DECelms. If the error persists, contact your Digital customer service representative.

Registry created.

Explanation: An informational message indicating that ELMS$NIMUXPRC started for the first time and created the DECelms registry.

Remove operation aborted by user.

Explanation: An informational message indicating that you entered a DELETE command with KNOWN BRIDGES, KNOWN DEVICES, or KNOWN CONCENTRATORS as the command domain but did not enter YES to the confirmation prompt.

Requested address already in forwarding database.

Explanation: You entered the ADD ADDRESS command for an address entry that is already present in the forwarding database of the target bridge.

User Action: Enter SHOW ADDRESS to display the entry for the address. If necessary, enter SET ADDRESS to modify the address entry.

Requested address not in forwarding database.

Explanation: You entered a SET ADDRESS, REMOVE ADDRESS, or SHOW ADDRESS command for an address entry that is not present in the forwarding database of the target bridge.

User Action: Use the ADD ADDRESS command if you want to add an entry for the address.

Requested value already in protocol database.

Explanation: You entered the ADD PROTOCOL command for a protocol value that is already present in the protocol database of the target bridge.

User Action: Enter SHOW PROTOCOL command to display the entry for the protocol value. If necessary, enter SET PROTOCOL to modify the protocol entry.

Requested value not in protocol database.

Explanation: You entered a SET PROTOCOL, REMOVE PROTOCOL, or SHOW PROTOCOL command for a protocol entry that is not present in the protocol database of the target bridge.

User Action: Use the ADD PROTOCOL command if you want to add an entry for the protocol value.

Send Initialize Device request to device.

Explanation: An informational message caused by your YES response to the confirmation prompt that DECelms displays after receiving an INITIALIZE command.

Service not found.

Explanation: The polling information associated with a DECelms registry entry is not present, preventing DECelms from polling the device.

User Action: Use the DELETE command to remove each registry entry that caused the error. Use the REGISTER command to add a new entry for each device.

SHOW BRIDGE COUNTERS display not appropriate for a LAN Traffic Monitor.

Explanation: You cannot display the counters of a bridge that is serving as a LAN Traffic Monitor (LTM) listener; in that case, SHOW CHARACTERISTICS is the only valid monitoring command.

SHOW BRIDGE STATUS display not appropriate for a LAN Traffic Monitor.

Explanation: You cannot display the status of a bridge that is serving as a LAN Traffic Monitor (LTM) listener; in that case, SHOW CHARACTERISTICS is the only valid monitoring command.

Show 'EVERY' is legal only for Device and Line Counters.

Explanation: You entered the EVERY *nn* SECONDS or EVERY *nn* MINUTES phrase for a command other than SHOW COUNTERS or MONITOR.

User Action: Enter the EVERY phrase only with the SHOW COUNTERS or MONITOR command.

SHOW LINE SPANNING CHARACTERISTICS display not appropriate for given device.

Explanation: You entered the SHOW SPANNING CHARACTERISTICS command for a DECconcentrator 500 line or a line on a bridge that is serving as a LAN Traffic Monitor listener. These devices do not participate in the spanning tree computation process.

User Action: Enter the SHOW SPANNING CHARACTERISTICS command only when a bridge or a bridge line is the command domain.

SHOW SPANNING CHARACTERISTICS display not appropriate for given device.

Explanation: You cannot display the spanning tree parameters of a bridge that is serving as a LAN Traffic Monitor (LTM) listener; in that case, SHOW CHARACTERISTICS is the only valid monitoring command. DECconcentrator 500 devices do not have spanning tree parameters because they do not participate in the spanning tree computation process.

User Action: Enter the SHOW SPANNING CHARACTERISTICS command only when a bridge or a bridge line is the command domain.

Start command completed.

Explanation: An informational message indicating that your START POLLER command started the background poller function, that your START LISTENER command started the device listener function, or that your START ALARM command started the display of event messages.

Start command failed.

Explanation: Your START POLLER command failed to start the background poller function, your START LISTENER command failed to start the device listener function, or your START ALARM command failed to start the display of event messages.

User Action: Reenter the command.

Status Code not found.

Explanation: DECelms encountered an internal error.

User Action: Contact your Digital customer service representative.

Stop command completed.

Explanation: An informational message indicating that your STOP POLLER command stopped the background poller function, that your STOP LISTENER command stopped the device listener function, or that your STOP ALARM command stopped the display of event messages.

Stop command failed.

Explanation: Your STOP POLLER command failed to stop the background poller function, your STOP LISTENER command failed to stop the device listener function, or your STOP ALARM command failed to stop the display of event messages.

User Action: Reenter the command.

Storage place full.

Explanation: You cannot add information to the DECelms registry because the disk is full.

User Action: Obtain more disk space on the disk where the DECelms registry is stored.

Tested channel status did not return normal: *value.*
Channel status tested was: *value.*

Explanation: DECelms is having difficulty communicating with your terminal.

User Action: Contact your Digital customer service representative.

Tested device status did not return normal: *value*.
Device status tested was *value*.

Explanation: DECelms is having difficulty communicating with your terminal.

User Action: Contact your Digital customer service representative.

The current device that is selected -
device-name did not respond to message.

Explanation: The target device in your command is not responding to DECelms messages. If the command domain is KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES, DECelms displays this message for each device that does not respond.

User Action: Check the device hardware to find out why the target device is inactive, correct the problem, and reenter the command. If the target device is a LAN Bridge 150 or a LAN Bridge 200, try using the address of the other line.

The device NVRAM test failed!

Explanation: The device nonvolatile memory (NVRAM) may have failed. (DECelms reads the device's status before sending certain commands to the device, such as INITIALIZE, INITIALIZE WITH DEFAULTS, ENABLE, and DISABLE.)

User Action: Call your Digital customer service representative to inspect the device.

The KNOWN option is not allowed for this command.

Explanation: You entered a command that cannot be used when the command domain is KNOWN LINES, KNOWN BRIDGES, KNOWN CONCENTRATORS, or KNOWN DEVICES.

User Action: Reenter the command with a valid command domain.

The number is too large for this variable.

Explanation: You entered too large a value for a parameter.

User Action: Enter a value within the legal range.

This ACCOUNT does not have the RIGHTS IDENTIFIER ELMS
which is required for this command.

Explanation: You have tried to enter a privileged DECelms command, but the ELMS rights identifier is not associated with your account.

User Action: Have the system manager associate the ELMS rights identifier with your account, or use DECelms from a privileged account.

This entry is not in your registry.
Please add if you want an ASCII name associated with it.

Explanation: You entered a device name that is not listed in the DECelms registry.

User Action: Add the device to the registry if you want to associate an ASCII name with it, or reenter the command using the device address.

This function not allowed for a line.

Explanation: A device line is the command domain. You entered a command that is valid for a device but not for a line.

User Action: Enter a command that is valid for a line, or enter USE *device-id* if you are trying to manage a device rather than its lines.

Unexpected message from NIMUX.

Explanation: DECelms encountered an internal error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Unrecognized input value.

Explanation: You entered invalid information.

User Action: Check your command syntax and parameter values.

Unrecognized NIMUX reply.

Explanation: DECelms encountered an internal error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Unrecognized NIMUX reply status: *status*.

Explanation: DECelms encountered an internal error.

User Action: From the DCL prompt, enter the SHOW SYSTEM command to see if the process ELMS$NIMUXPRC is running. If not, enter @SYS$STARTUP:ELMS$STARTUP. If that does not work, contact your Digital customer service representative.

Value too high. Maximum value is *value* (hex).

Explanation: You entered too large a value for a parameter.

User Action: Enter a value within the legal range.

Value too low. Minimum value is *value* (hex).

Explanation: You entered too small a value for a parameter.

User Action: Enter a value within the legal range.

WARNING: Inconsistent configuration data in SIF response.

Explanation: The SIF Configuration Information Response or SIF Operation Information Response returned by the target station contained inconsistent or uninterpretable data.

User Action: Reenter the SHOW SIF CONFIGURATION or SHOW SIF OPERATION frame that caused the error message.

You can only do a periodic display of multiple device counters
if you direct them to a file using the TO file option.

Explanation: If you use the EVERY option of the SHOW COUNTERS command when KNOWN BRIDGES, KNOWN CONCENTRATOR, or KNOWN DEVICES is the command domain, you must use the TO phrase to send the output to a file.

User Action: Reenter the command. Include the TO phrase and file specification to send the output to a file. (You can specify the directory and file name, but not the node name or the device name.)

You can only do a periodic display of multiple line counters if you direct them to a file using the TO file option.

Explanation: If you use the EVERY option of the SHOW COUNTERS command when KNOWN LINES is the command domain, you must use the TO phrase to send the output to a file.

User Action: Reenter the command. Include the TO phrase and file specification to send the output to a file. (You can specify the directory and filename, but not the node name or the device name.)

You have typed illegal syntax for the SHOW command.

Explanation: You entered invalid syntax for one of the SHOW commands.

User Action: Reenter the command with the correct syntax.

You have typed in illegal syntax for the ADD command.

Explanation: You entered invalid syntax for one of the ADD commands.

User Action: Reenter the command with the correct syntax.

You have typed in illegal syntax for the REMOVE command.

Explanation: You entered invalid syntax for one of the REMOVE commands.

User Action: Reenter the command with the correct syntax.

You have typed in illegal syntax for this command.

Explanation: You entered invalid syntax for one of the DECelms commands.

User Action: Reenter the command with the correct syntax.

C
Protocol Values

This appendix lists protocol values that appear in the various types of frames that DECelms (DEC Extended LAN Management Software) allows you to filter or forward. You can use this information when adding the protocol entries to the protocol database of a bridge. This appendix contains the following information:

- Ethernet Protocol Type Values
- IEEE 802.2 LSAP Protocol Values
- IEEE 802.2 SNAP Protocol IDs

C.1 Ethernet Protocol Type Values

This section lists Ethernet Protocol Type values. These are 2-byte hexadecimal values in the form *nn-nn* that appear in the Protocol Type field of Ethernet frames. They identify the higher-layer protocol information contained in the frame. To instruct a bridge to forward or filter frames with one of these Protocol Type values, enter the code as the value in a DECelms command such as the following:

```
ELMS> ADD PROTOCOL value DISPOSITION FILTER PASSWORD password
```

This section contains the following tables:

- Public Ethernet Protocol Types
- Digital Ethernet Protocol Types

- Publicly Available Private Ethernet Protocol Types

C.1.1 Public Ethernet Protocol Types

Table C–1 lists the public Ethernet Protocol Type values.

Table C–1: Public Ethernet Protocol Types

Protocol Value	Description
01-01 to 01-FF	Experimental
06-00	Xerox NS Internet (XNS)
08-00	DoD Internet (TCP/IP)
08-01	X.75 Internet
08-02	NBS Internet
08-03	ECMA Internet
08-04	CHOASnet, proposed by Symbolics, Inc.
08-05	X.25 Level 3
08-06	Ethernet Address Resolution Protocol (ARP)
08-1C	Proposed by Symbolics, Inc.
80-06	Nestar
90-00	Loopback

C.1.2 Digital Ethernet Protocol Types

Table C–2 lists the Ethernet Protocol Types assigned by Digital from its block of values.

Table C–2: Digital Ethernet Protocol Types

Protocol Value	Type	Description
60-01	DEC_ MOPDL	DNA Dump/Load (MOP)
60-02	DEC_ MOPRC	DNA Remote Console (MOP)

Table C–2 (Cont.): Digital Ethernet Protocol Types

Protocol Value	Type	Description
60-03	DEC_NET	DNA Routing
60-04	DEC_LAT	Local Area Transport (LAT)
60-05	DEC_DIAG	Diagnostics
60-06	DEC_C_USE	Customer use
60-07	DEC_LAVC	System Communication Architecture (SCA)
80-38	DEC_ BRIDGE	DEC Spanning Tree
80-3B		VAXELN software
80-3C		DNA Naming Service
80-3D		CSMA/CD Encryption
80-3F	DEC_LTM	LAN Traffic Monitor
80-40		NetBios emulator (PCSG)
80-42		Reserved

C.1.3 Publicly Available Private Ethernet Protocol Types

Table C–3 lists Ethernet Protocol Type values held by the organizations that decided to make this information publicly available. Refer to the organization's documentation for the codes assigned to specific protocols.

Table C–3: Publicly Available Private Ethernet Protocol Types

Protocol Value	Organization Name	Location
04-00	Nixdorf Computer, AG	Fuerstenaller, West Germany
08-88 to 08-8A	Xyplex	Concord, MA
09-00	Ungermann-Bass (Network Debugger)	California
0A-00	Xerox Corp.	Stamford, CT
0B-AD	Banyan Systems	Westboro, MA

Table C–3 (Cont.): Publicly Available Private Ethernet Protocol Types

Protocol Value	Organization Name	Location
10-00	Berkeley Trailer (Negotiation)	Berkeley, CA
10-01 to 10-0F	Berkeley Trailer (Encapsulation, IP Trailer Block)	Berkeley, CA
52-08	Bolt Beranek and Newman Inc. (Simnet)	Cambridge, MA
60-10 to 60-14	3Com Corp.	Santa Clara, CA
70-00	Ungermann-Bass (Download)	California
70-01 to 70-02	Ungermann-Bass (NIU)	California
70-03	Interlan	Boxborough, MA
70-20 to 70-29	LRT	Reading, Berks, England
70-30	Proteon	Natick, MA
80-03	Cronus Industries, Inc. (VLN)	Dallas, TX
80-04	Cronus Industries, Inc. (Direct)	Dallas, TX
80-05	Hewlett-Packard Co.	Palo Alto, CA
80-06	Nestar	San Jose, CA
80-08	American Telephone & Telegraph Co.	New York, NY
80-10	Excelan, Inc.	San Jose, CA
80-13	Silicon Graphics Inc. (Diagnostics)	Mountain View, CA
80-14	Silicon Graphics Inc. (Network Games)	Mountain View, CA
80-15	Silicon Graphics Inc. (reserved)	Mountain View, CA
80-16	Silicon Graphics Inc. (XNS Name Server)	Mountain View, CA

Table C–3 (Cont.): Publicly Available Private Ethernet Protocol Types

Protocol Value	Organization Name	Location
80-19	Apollo Computer Inc., sub. of Hewlett-Packard Co.	Chelmsford, MA
80-2E	Tymshare	Cupertino, CA
80-2F	Tigan, Inc.	Palo Alto, CA
80-35	Stanford University (Reverse ARP)	Stanford, CA
80-36	Aeonic Systems	Billerica, MA
80-44	Planning Research Corp., sub. of Emhart PRC	McLean, VA
80-46 to 80-47	American Telephone & Telegraph Co.	New York, NY
80-49	Expert Data	Boulogne, France
80-5B to 80-5C	Stanford University (V System)	Stanford, CA
80-5D	Evans & Sutherland Computer Corp.	Salt Lake City, UT
80-60	Little Machines	San Diego, CA
80-62	Counterpoint Computers	San Jose, CA
80-65 to 80-66	University of Massachusetts	Amherst, MA
80-67	Veeco Integrated Automation	Dallas, TX
80-68	General Dynamics Corp., Fort Worth Div.	Fort Worth, TX
80-69	American Telephone & Telegraph Co.	New York, NY
80-6A	Autophon	Solothurn, Switzerland
80-6C	ComDesign	Goleta, CA
80-6D	Compugraphic Corp., sub. of Bayer AG	Wilmington, MA

Table C–3 (Cont.): Publicly Available Private Ethernet Protocol Types

Protocol Value	Organization Name	Location
80-6E to 80-77	Landmark Graphics Corp.	Houston, TX
80-7A	Matra	Paris, France
80-7B	Dansk Data Elektronik A/S	Herlev, Denmark
80-7C	University of Michigan	Ann Arbor, MI
80-7D to 80-7F	Vitalink Communications Corp.	Fremont, CA
80-80	Vitalink Communications Corp. (Bridge Management)	Fremont, CA
80-81 to 80-83	Counterpoint Computers	San Jose, CA
80-9B	Kinetics (AppleTalk)	Walnut Creek, CA
80-9C to 80-9E	Datability	New York, NY
80-9F	Spider Systems Ltd.	Edinburgh, Scotland
80-A3	Nixdorf Computer, A.G.	Fuerstenaller, West Germany
80-A4 to 80-B3	Siemens Gammasonics, sub. of Siemens A.G.	Des Plaines, IL
80-C0 to 80-C3	Digital Communications Associates Inc.	Alpharetta, GA
80-C6	Pacer Software	La Jolla, CA
80-C7	Applitek Corp.	Wakefield, MA
80-C8 to 80-CC	Intergraph Corp.	Huntsville, AL
80-CD to 80-CE	Harris Corp.	Melbourne, FL
80-CF to 80-D2	Taylor Instruments	Rochester, NY
80-D3 to 80-D4	Rosemont Corp.	La Habra, CA
80-D5	Ungermann-Bass	California
80-DD	Varian Associates	Palo Alto, CA

Table C–3 (Cont.): Publicly Available Private Ethernet Protocol Types

Protocol Value	Organization Name	Location
80-DE to 80-DF	Integrated Solutions (Transparent Remote File System)	San Jose, CA
80-E0 to 80-E3	Allen Bradley Co., sub. of Rockwell International Corp.	Ann Arbor, MI
80-E4 to 80-F0	Datability	New York, NY
80-F2	Retix	Santa Monica, CA
80-F3	Kinetics (AppleTalk Address Resolution Protocol)	Walnut Creek, CA
80-F4 to 80-F5	Kinetics	Walnut Creek, CA
80-F7	Apollo Computer Inc., sub. of Hewlett-Packard Co.	Chelmsford, MA
80-FF to 81-03	Wellfleet Communications	Bedford, MA
81-07 to 81-09	Symbolics, Inc.	Cambridge MA
81-30	Waterloo Manufacturing Co., Ltd.	Waterloo, Ontario, Canada
81-31	VG Laboratory Systems	Cheshire, England
81-37 to 81-38	Novell, Inc.	Provo, UT
81-39 to 81-3D	KTI	San Jose, CA
90-01	Bridge, Inc. (Bridge Management)	Cupertino, CA
90-02	Bridge, Inc. (Terminal Servers)	Cupertino, CA
AF-AF	Logicraft	
FF-00	Bolt Beranek and Newman Inc. (VITAL-LANBridge)	Cambridge, MA

C.2 IEEE 802.2 LSAP Protocol Values

Table C–4 lists the IEEE 802.2 LSAP protocol values. These values appear in the DSAP (Destination Service Access Point) and SSAP (Source Service Access Point) fields of IEEE 802.3 frames, identifying the higher-layer protocol contained in the frame. IEEE 802.2 LSAP protocol values are one hexadecimal byte in the form *nn*.

The LSAP (DSAP and SSAP) values are assigned by the IEEE; each one identifies a particular protocol defined by a national or international standard. For example, an IEEE 802.3 frame with FE in its SSAP and DSAP fields contains higher-layer information that conforms to the ISO Connectionless-Mode Network Protocol (ISO 8473).

To instruct a bridge to forward or filter (discard) frames with one of these IEEE 802.2 LSAP protocol values, enter the code as the value in a DECelms command such as the following:

```
ELMS> ADD PROTOCOL value DISPOSITION FILTER PASSWORD password
```

Table C–4: LSAP Protocol Values

Protocol Value	Description
00	Null LSAP
02	Individual Logical Link Control (LLC) Sublayer Management Function
03	Group Logical Link Control (LLC) Sublayer Management Function
06	Transmission Control Protocol/Internet Protocol (TCP/IP)
0E	PROWAY Network Management and Initialization
42	Bridge Spanning Tree Protocol
4E	Manufacturing Message Service
8E	PROWAY-LAN
AA	Sub-Network Access Protocol (SNAP)
FE	ISO Connectionless-Mode Network Protocol
FF	Global LSAP

C.3 IEEE 802.2 SNAP Protocol IDs

Table C–5 lists the IEEE 802.2 SNAP Protocol IDs assigned by Digital Equipment Corporation. For SNAP Protocol IDs assigned by other organizations, refer to the organization's documentation or contact the organization directly.

SNAP Protocol IDs identify the higher-layer protocol contained in a frame in the case where the protocol is not a national or international standard. In an IEEE 802.2 SNAP frame, the first 5 bytes after the control field form the Protocol-ID field. The Protocol-ID value is 5 bytes in the form *nn-nn-nn-nn-nn*. The first 3 bytes are taken from the 24-bit organization unique identifier assigned by the IEEE; the last 2 bytes are assigned by the owner of the organization unique identifier. For example, an IEEE 802.2 SNAP frame with the value 08-00-2B-80-3C in its Protocol-ID field contains a DNA Naming Service protocol message (08-00-2B is the organization unique identifier for Digital).

To instruct a bridge to forward or filter frames with one of these IEEE 802.2 SNAP Protocol IDs, enter the Protocol ID as the value in a DECelms command such as the following:

```
ELMS> ADD PROTOCOL value DISPOSITION FILTER PASSWORD password
```

Table C–5: Digital IEEE 802.2 SNAP Protocol Identification Assignments

Protocol Identification Code	Assignment
08-00-2B-60-01	DNA Dump/Load (MOP)
08-00-2B-60-02	DNA Remote Console (MOP)
08-00-2B-60-03	DNA Routing
08-00-2B-60-04	Local Area Transport (LAT)
08-00-2B-60-05	Diagnostics
08-00-2B-60-06	Customer use
08-00-2B-60-07	System Communication Architecture (SCA)
08-00-2B-80-3B	VAXELN software

Table C–5 (Cont.): Digital IEEE 802.2 SNAP Protocol Identification Assignments

Protocol Identification Code	Assignment
08-00-2B-80-3C	DNA Naming Service
08-00-2B-80-3D	CSMA/CD Encryption
08-00-2B-80-3F	LAN Traffic Monitor
08-00-2B-80-40	NetBios emulator (PCSG)
08-00-2B-90-00	MOP LAN Loopback protocol

D

Bridge Line Monitor Algorithms

The following algorithms are used to derive the LAN Bridge 200 Line Monitor statistics. For a full description of invoking the LAN Bridge 200 Line Monitor and interpreting its displays, see Section 5.6.

Assume that line 1 (port A) was selected for monitoring. Note that 10,000,000 is the Ethernet data rate (10 megabits per second). All statistics are expressed as percentages.

Utilization Statistics

- Total LAN Utilization:

  lan_bits_seen_since_start =

  $$(Total\ Bytes\ Received + Total\ Bytes\ Sent) * (8\ bits/byte) + frame\_overhead$$

  lan_bits_seen_since_start is taken at two intervals:

  $$lan\_rate\ in\ bits/sec = \frac{Difference\ between\ the\ two\ intervals}{Number\ of\ elapsed\ seconds}$$

  $$lan\_utilization\_percentage = \frac{lan\_rate\ bits/sec}{10Mbits/sec}$$

- Multicast LAN Utilization:

  $$multicast\_utilization\_percentage = (\%\ multicast\ bits) * lan\_utilization\_percentage$$

- Single Destination LAN Utilization:

  single_dest_utilization_percentage =

$$lan\_utilization\_percentage - multicast\_utilization\_percentage$$

LAN Multicast/Single Destination Percentages

$$util\_multi\_percent = \frac{Multicast\ Frames\ Received + Multicast\ Frames\ Sent}{Total\ Frames\ Received + Total\ Frames\ Sent}$$

$$util\_single\_percent = 100 - util\_multi\_percent$$

Port Throughput Statistics

Total Frames Sent is taken at two intervals:

$$port\_total\_throughput\ in\ frames/sec = \frac{Difference\ between\ two\ intervals}{Number\ of\ elapsed\ seconds}$$

$$port\_multi\_throughput = (\%\ multicast\ traffic) * (port\_total\_throughput)$$

$$port\_multi\_throughput\_percentage = \frac{port\_multi\_throughput}{port\_total\_throughput}$$

$$port\_single\_dest\_throughput\_percentage = 100 - port\_multi\_throughput\_percentage$$

Port Filtering Statistics

$$frames\_filtered\_percentage = \frac{Frames\ Filtered}{Total\ Frames\ Received}$$

$$frames\_forwarded\_percentage = \frac{Frames\ Forwarded}{Total\ Frames\ Received}$$

$$frames\_kept\_percentage = \frac{Device\ Frames\ Received}{Total\ Frames\ Received}$$

DECelms Glossary

This glossary defines the terminology used within DECelms (DEC Extended LAN Management Software) and its documentation.

A (physical port type)
A physical port on a dual access station or a dual access concentrator that connects to the incoming primary ring and the outgoing secondary ring of the FDDI dual ring.

address entry
An entry in the forwarding database of a bridge that controls the disposition of frames that contain the address of the entry.

aging
The process that a bridge uses to purge inactive learned address entries from its forwarding database. If the bridge does not see the address of an entry in the source address of a frame during the aging time, the bridge marks the entry inactive. The bridge then removes the inactive entries the next time it purges its forwarding database.

automatic registry configuration
The method of filling the DECelms registry by enabling the device listener function. The device listener function registers devices by listening to the MOP system ID messages transmitted on the extended LAN.

B (physical port type)
A physical port on a dual access station or a dual access concentrator that connects to the outgoing primary ring and the incoming secondary ring of the FDDI dual ring.

background poller function
A DECelms function that polls the devices listed in the DECelms registry. The background poller function maintains a database of device states and recognizes events if the state information returned by the polled device is different.

BACKUP (line state)

The line state in which a line can only listen to Hello messages that it receives. A line is put into the BACKUP state as a result of the spanning tree computation process so that there are no loops in the spanning tree.

BCP (Bridge Control Program)

The user interface module of DECelms. The BCP module allows multiple user access to DECelms, parses command input, determines the appropriate message to send to the device, maps the ASCII device name to its physical address, forwards the message to the NIMUX (network interface) module, and displays the device's response to the command.

bridge

A data link relay that joins two Ethernet/IEEE 802.3 segments or an Ethernet/IEEE 802.3 segment and an FDDI ring to create an extended LAN. The bridge is a specialized store-and-forward and packet-filtering device.

bridge state

The operational status of a bridge. Bridge states include INIT, PREFORWARDING, FORWARDING, BACKUP, and BROKEN.

bridge strip frame strip mode

A method of stripping frames from the FDDI ring where the station maintains a Sent count of frames sent since obtaining the token, sends a void frame when the transmission is complete (two void frames if it is serving as the ring purger), and strips the returning frames from the ring until its Sent count is decremented to zero. The DECbridge 500 uses the bridge strip frame strip mode.

broadcast address

FF-FF-FF-FF-FF-FF, a special type of multicast address. All nodes listen for and read frames sent to the broadcast address.

BROKEN (bridge state)

The bridge state entered when an error occurs during the bridge's self-test. During this state, the bridge reenters the SELF-TEST state every 15 seconds until the bridge is powered off.

BROKEN (line state)

The line state in which a line is unable to operate.

characteristics

Static information about a device, its lines, or its physical ports that you can display with the SHOW CHARACTERISTICS command.

claim token process

The process by which FDDI stations initialize the ring. The claim token process sets the target token rotation time (TTRT, the ANSI parameter T_ Neg) used by all stations on the ring and determines the station that will originate the token.

collision

Multiple transmissions overlapping on Ethernet/IEEE 802.3 medium, resulting in garbled data and necessitating retransmission.

Collision Detect

A signal provided by the Physical layer to the Data Link layer on an Ethernet\IEEE 802.3 node indicating that one or more stations are contending with the local station's tranmission.

command bar

The shaded area near the bottom of the DECelms screen, just above the message window, that shows the commands available within the display window. The commands that apply to the current display are highlighted.

command domain

The context and entity to which a DECelms command will apply.

command window

The window on the DECelms screen that contains the DECelms prompt, the command that you enter, DECelms informational messages, and syntax error messages. The command window appears on screen continuously unless you have entered one of the SHOW commands, the LIST command, the MESSAGE command, or the MONITOR command.

cost path

The sum of all the Line Cost values in the path between a bridge and the root.

counters

Operational and error statistics maintained by a device for the device itself and for its lines and physical ports. DECelms remotely displays the counters of a device.

CPT (Collision Presence Test) characteristic

A line characteristic that you can set with DECelms to inform the bridge whether the Ethernet/IEEE 802.3 transceiver on a line is using the collision presence test.

CRC (Cyclic Redundancy Check)
A method of detecting errors in a frame by performing a mathematical calculation of the number of bits in the frame and appending the result to the end of the frame. The receiving station performs the same calculation on the frame and then checks that the result matches the CRC at the end of the frame.

CSMA/CD (Carrier Sense Multiple Access with Collision Detection)
A method that allows multiple stations to access an Ethernet/IEEE 802.3 transmission medium. The stations wait until they detect that the medium is idle and then transmit. The stations can detect if more than one station transmitted at once (a collision) and recover by retransmitting at staggered intervals.

Data Link layer
The second layer in the International Organization for Standardization model for open systems interconnection (ISO/OSI). The Data Link layer implements a medium independent link-level communication facility on top of the Physical layer.

DECelms (DEC Extended LAN Management Software)
A VMS layered product that remotely manages the bridges and wiring concentrators in an extended LAN.

DECelms registry
A directory of the bridges and wiring concentrators in an extended LAN, stored on the VAX system running DECelms.

default domain
The domain (target entity) established by the most recently issued USE command. DECelms commands apply to the default domain unless you specify another entity in the command itself.

designated bridge
The next closest bridge on the path to the root, as determined by the outcome of the spanning tree computation process.

destination address
The field in a frame that contains the address of the station to which the frame is being sent.

device address
A sequence of 12 hexadecimal characters in the form *nn-nn-nn-nn-nn-nn* that uniquely identifies a device. The first 6 characters are the organization unique identifier of the manufacturer (08-00-2B for Digital).

device identification

The name of a device (assigned with DECelms) or its hardware address.

device entry

Entries in the DECelms registry that describe the bridges and wiring concentrators in the extended LAN. Each device entry includes the device type, the device address (the addresses of both lines on the bridge for all bridge models except for the LAN Bridge 100), the ASCII name assigned to the device, and a short description.

device listener function

A DECelms function that automatically creates DECelms registry entries for the bridges and wiring concentrators on the extended LAN. When enabled, the device listener function detects new devices by monitoring the MOP System ID messages on the extended LAN.

device name

An ASCII string assigned to a device in the DECelms registry. All device names must be unique within the DECelms registry. Device names can be used in DECelms commands instead of cumbersome hardware addresses.

device parameters

Characteristics of a device, including settable and nonsettable spanning tree parameters (for bridges) and other parameters.

device resident database

A collection of crucial parameter values stored in a device's nonvolatile memory (NVRAM) to allow restarting with predictable values.

DISABLED (line state)

The line state in which a line does not forward frames, does not learn forwarding addresses from received frames, and does not take part in the spanning tree process. In the DISABLED state, a line continues to listen to Hello messages and can receive and transmit management messages under certain conditions.

display window

The window that appears on the DECelms screen when you enter one of the SHOW commands, the LIST command, the MESSAGES command, or the MONITOR command.

disposition

An indication of how the bridge is to dispose of frames that contain the address of a forwarding entry or the protocol value of a protocol entry. When the disposition is FILTER, the bridge discards the frames; when the disposition is FORWARD, the bridge forwards the frames.

domain
The entity (bridge, wiring concentrator, line, or physical port) to which a DECelms command applies.

down-line load host
A DECnet-VAX host that is configured with the Network Control Program (NCP) to respond to device requests for down-line loads of software.

down-line loading
The process by which a host computer loads operational software into a device across the network.

dual attachment concentrator (DAC)
A wiring concentrator that is attached to both the primary and secondary rings of the FDDI dual counter-rotating ring.

dual attachment station (DAS)
An FDDI node (other than a wiring concentrator) that is attached to both the primary and secondary rings of the FDDI dual counter-rotating ring.

duplicate address test
A test performed by an FDDI station to determine if a duplicate of its own address is present on the ring.

duration
A parameter of the START LISTENER command that sets the length of time that the device listener function listens for new devices on the MOP remote console channel before pausing for the idle time, another settable parameter.

entity
The physical component affected by a DECelms command: a specific bridge or wiring concentrator, all the bridges, wiring concentrators, or devices listed in the DECelms registry, a specific line on a device, both lines on a bridge, a specific physical port, or all the physical ports on a wiring concentrator.

event description
An event entry added to the event log by the device listener function or the background poller function.

event message
Messages describing device state changes and other events that are generated by the device listener function and the background poller function. Event messages are displayed in the event window of the DECelms screen.

event log

A collection of event descriptions generated by the device listener function and the background poller function. The current event log file is SYS$COMMON:[ELMS$DIRECTORY]ELMS$STATE_CHANGE.LOG.

exclusive address filtering

A form of forwarding where the bridge filters (discards) only frames with addresses that have a management entry set to FILTER.

exclusive protocol filtering

A form of forwarding where the bridge filters (discards) only frames with protocol IDs that have a management entry set to FILTER.

explicit protocol entry

Entries that identify a specific protocol value and instruct the bridge to forward or filter frames that have that value in their Protocol ID fields.

extended LAN

Two or more local area networks (LANs) connected by a bridge or bridges. The stations connected to these LANs are able to communicate with one another as if they were all on the same LAN.

FDDI Network

A fiber optic network that meets the ANSI X3T9 standard. FDDI networks have a dual counter rotating ring topology, use the timed token passing access method, and operate at 100 megabits per second.

filtering

The process by which a bridge filters (discards) or forwards frames based on the address or protocol type of the frames. Address and protocol entries control the filtering decisions made by a bridge.

flooding

The process by which a bridge sends out frames on the LAN that is not the datagram's source LAN. This happens when the bridge receives a datagram with a destination address that is not listed in the bridge's forwarding database.

forwarding

The process in which a bridge receives a frame on one LAN segment and transmits it on the other LAN segment.

FORWARDING (line state)

The line state in which the line is fully operational and can perform all functions, including the forwarding of frames.

forwarding database

A table maintained by a bridge that contains a list of addresses and the bridge line number on which the address can be reached. The bridge creates its forwarding database through **learning** (noting the source line and source address of each incoming frame). You can add, remove, and modify forwarding entries with DECelms.

Fragmentation software switch

A software switch on a DECbridge 500 that controls the fragmentation of large Internet Protocol (IP) frames received on the FDDI line into smaller frames that can be transmitted on the Ethernet/IEEE 802.3 line.

frame

On the Ethernet/IEEE 802.3 medium, a group of bits sent across the network between layer 2 (data link) entities. The first several bits are a header that contains address and other control information, followed by the user data field, and terminated by a cyclic redundancy check (CRC) used for error detection. A frame consists of a variable number of bytes up to a maximum of 1518.

On an FDDI ring, a Protocol Data Unit (PDU) transmitted between cooperating MAC entities on a ring. A frame consists of a variable number of bytes up to a maximum of 4500.

header

The first fields of a frame, which contain the destination address, source address, message numbering, and other control information.

Hello messages

Messages transmitted by all bridges when they are first activated. The information in the Hello messages determines which bridges are elected as designated bridges and which bridge becomes the root bridge. When the spanning tree computation process is complete, the root bridge originates the Hello message and the other bridges propagate it down the spanning tree.

host

The VAX system on which DECelms is running.

idle time

A parameter of the START LISTENER command that sets the length of time that the device listener function pauses between durations and does not listen for new devices on the MOP remote console channel. A parameter of the START POLLER command that sets the length of time that the background poller process pauses between each polling sequence.

IEEE 802.3

A standard published by the Institute of Electrical and Electronic Engineers that defines the CSMA/CD media access method and the Physical layer specifications of a network.

Inactive entry

An address entry that a bridge has marked inactive but not yet purged from its forwarding database. A bridge marks an address entry inactive if it does not see it in the source address of a frame during the aging time in effect for its forwarding database.

INIT (bridge state)

The bridge state entered after the bridge successfully completes its self-test. If no down-line loading is to occur, the bridge exits to the PREFORWARDING state.

INIT (line state)

The line state in which the line is initializing and cannot be used for any purpose.

Internet Protocol (IP) fragmentation

The process by which a DECbridge 500 breaks up large IP frames received on its FDDI line into smaller frames that can be transmitted on it's Ethernet/IEEE 802.3 line. This fragmentation is necessary because the maximum size for a frame on an FDDI ring is 4500 octets, but only 1518 octets for an Ethernet/IEEE 802.3 segment.

LAN (local area network)

A data communications network that spans a physically limited area (generally less than a mile or two), provides high-bandwidth communication over inexpensive media (generally coaxial cable or twisted pair), provides a switching capability, and is usually owned by the user (that is, not provided by a common carrier .

LAN Bridge 200 Line Monitor

A LAN Bridge 200 module that collects utilization, throughput, and multicast percentage statistics for the LAN attached to one of the bridge lines. You can display this information with DECelms and set the interval at which DECelms will update the displays.

learned entry

An address entry added to the forwarding database by the bridge's learning process. The bridge learns addresses by noting the source address and source line of incoming frames.

learning process

The process in which the bridge uses the source address in the data link header information of each received frame to build a table of addresses and the bridge line number on which they can be reached.

LEM threshold

The bit error rate threshold assigned to a physical port on an FDDI station. The link error monitor (LEM) function of the station measures the quality of the physical port during normal operation. The station disables the physical port when its bit error rate rises above the threshold, preventing it from disrupting the ring.

line (Ethernet/IEEE 802.3)

An entity that includes both the Media Access Control (MAC) function and the Physical layer function of a bridge's link to an Ethernet/IEEE 802.3 LAN.

line (FDDI)

An entity that identifies the FDDI Media Access Control (MAC) function of the FDDI link of a DECbridge 500 or a DECconcentrator 500. On both devices, the FDDI line is line 1.

line cost

A spanning tree parameter set for each line on a bridge and used to determine the network logical topology through the spanning tree computation process. The line cost must be in the range 1 to 255; the default value is 10. Line cost is assigned to a line based on its bandwidth and anticipated traffic.

line ID

The number of a device line: 1 or 2. Line numbers are assigned by the device itself.

line state

The operational state of a bridge line. Line states are INIT, PREFORWARDING, FORWARDING, BACKUP, DISABLED, and BROKEN.

link confidence test

A test that an FDDI station performs on its physical ports while they are initializing. The physical port cannot form a connection until it passes the link confidence test.

link error monitor threshold

See **LEM threshold.**

listener

A LAN Bridge 100 or LAN Bridge 150 model that is down-line loaded with LAN Traffic Monitor (LTM) software. The listener collects network utilization, throughput, and error information, which it transmits to the LTM host system for analysis and display. Do not confuse an LTM listener with the DECelms device listener function.

logical ring

An FDDI network comprised of all the connected MACs, viewed from the perspective of the topology of the connected MACs. In contrast to a physical ring, which views an FDDI network from the perspective of the topology of all physically connected nodes.

loop detection

The process by which the bridges in an extended LAN use the spanning tree computation process to ensure that there is only one path between any two stations.

LTM (LAN Traffic Monitor)

A VMS layered product that uses a bridge as a data-collection device known as an LTM listener. When down-line loaded with LTM software, the bridge collects network utilization and throughput statistics and then forwards the information to the LTM host system for analysis and display.

LTM listener

A LAN Bridge 100 or LAN Bridge 150 that has been down-line loaded with LAN Traffic Monitor (LTM) listener software. When down-line loaded with LTM software, the bridge collects network utilization and throughput statistics and then forwards the information to the LTM host system for analysis and display.

M (physical port type)

The physical port on a wiring concentrator that connects to an S port of another station.

management entry

An entry in the forwarding database or protocol database of a bridge that was added by DECelms. Management entries are immune from aging and permanently stored in nonvolatile memory (NVRAM) if there is enough room.

Manual Filter switch

A LAN Bridge 200 software switch that controls method of forwarding used by the bridge. When the Manual Filter switch is set to True, the bridge purges the learned entries from its forwarding database, stops its learning process, and forwards only frames with addresses that have a management entry set to FORWARD. When the Manual Filter switch is set to False, the bridge forwards normally.

manual registry configuration

Manually adding, modifying, and deleting device entries from the DECelms registry, using the DECelms REGISTER, MODIFY, and DELETE commands.

maximum token rotation time

The maximum target token rotation time (TTRT) that an FDDI station will allow to be negotiated in the claim token process. (Maximum token rotation time is the ANSI FDDI parameter T_Max; target token rotation time is the ANSI FDDI parameter T_Neg.) The maximum token rotation time also controls station operation during the claim token process itself. If the station has stopped bidding and is waiting for some other station to initialize the ring, the station resumes bidding when its maximum token rotation time expires.

message window

The two-line area at the bottom of the DECelms screen that displays event messages, error messages, and broadcast messages.

monitoring interval

The interval at which the LAN Bridge 200 Line Monitor updates its display. You can change the monitoring interval from its default of 6 seconds with DECelms.

multicast address

An address that identifies a group of stations rather than a single station.

Neighborhood Information Frame

See **NIF**.

NIF

Neighborhood Information Frame, a type of FDDI Station Management Protocol (SMT) frame that neighbor stations exchange to announce their address and type.

NIMUX

The network interface module of DECelms. The NIMUX queues DECelms commands to devices, handles retries and timeouts, demultiplexes device responses, and forwards the responses to the appropriate BCP module (when there is more than one user of DECelms).

nonprivileged mode

A mode of DECelms operation in which the user can use only the LIST, MONITOR, and SHOW commands. DECelms privilege modes are in effect only if the system manager has added the ELMS$RIGHTS_ID rights identifier to the system. Nonprivileged users are those who have not been granted ELMS$RIGHTS_ID. (See **privileged mode**.)

NVRAM (nonvolatile memory)

Nonvolatile random access memory in a bridge. Information stored in NVRAM is retained even if the bridge loses power.

OP oscillation

Ring operational oscillation, an error condition where the FDDI ring repeatedly comes up briefly and then goes back into initialization. This problem is frequently caused by a duplicate address condition.

OPERATE (bridge state)

The normal operational state of a bridge.

path cost

The sum of the line costs along the path between a bridge and the root bridge.

path to root

The series of bridges between a bridge and the root bridge. The path is a logical route created by the spanning tree computation process.

PC trace

The most drastic FDDI ring recovery procedure, where a station that is stuck beaconing has forced its upstream neighbors to perform their self tests. (A station is stuck beaconing when its FDDI MAC entity has been beaconing longer than the time defined by the ANSI FDDI parameter T_Stuck.)

permanent entry

An address or protocol entry that is stored in the bridge's nonvolatile memory (NVRAM), so that it is retained even if the bridge loses power.

physical address

A single-destination address, which identifies a single station. Compare with **multicast address** and **broadcast address**.

Physical layer

The lowest layer of the International Organization for Standardization model for open systems interconnection (ISO/OSI). The Physical layer is implemented by the physical channel using a specified medium. The Physical layer insulates the Data Link layer from medium-dependent physical characteristics such as baseband, broadband, or fiber-optic technologies.

physical port

An entity that includes the PHY and PMD functions of the FDDI link of a DECbridge 500 or a DECconcentrator 500. This entity is PHYPORT *nn* in DECelms commands, where *nn* is the identifier of the physical port.

PMD (Physical Media Dependent)

A media-dependent FDDI protocol layer that provides for the fiber, connector, and optical pulse requirements.

PREFORWARDING (line state)

The line state in which a line is in the process of turning on, learning forwarding addresses from incoming frames, and checking the network topology. The line listens to all Hello messages but does not forward them. At this time, the line does not receive or transmit management messages except under certain conditions.

privileged mode

A mode of operation in DECelms in which the user can issue all DECelms commands. DECelms privilege modes are in effect only if the system manager has added the ELMS$RIGHTS_ID rights identifier to the system. Privileged users are those who have been granted ELMS$RIGHTS_ID. (See **nonprivileged mode**.)

protocol database

A collection of protocol entries in a bridge. Each entry instructs the bridge to forward or filter (discard) frames that contain the protocol code of the entry.

protocol entry

An entry added with DECelms to the protocol database of a bridge that controls the disposition of frames that contain the protocol ID of the entry.

purging

The process by which a bridge periodically deletes inactive address entries from its forwarding database. The bridge marks an entry inactive when it does not see its address in the source field of a frame during the aging time in effect for the bridge.

registry entry

A device entry in the DECelms registry.

repeater

A device used to extend the length of the physical network medium beyond the limits imposed by a single segment. Repeaters restore signal amplitude, waveform, and timing to normal data signals.

requested token rotation time

The token rotation time (TRT, the ANSI parameter T_Req) value that an FDDI station will bid for in the claim token process. The claim token process sets the target token rotation time (TTRT, the ANSI parameter T_Neg) used by all stations on the ring and determines the station that will originate the token. The station with the lowest requested TRT value, longest address, and highest address wins the claim token process. The winning station establishes its requested TRT value as the target token rotation time and initializes the token.

ring

Two or more FDDI stations where information is passed sequentially between active stations, each station in turn examining or copying the information, finally returning it to the originating station.

ring beaconing

A ring recovery procedure initiated by an FDDI station when it detects a claim token process failure or a break in the ring.

ring purger

A station that purges the FDDI ring of fragments and no-owner frames. Stations bid to become the ring purger by sending Candidate Hello frames to the ring purger multicast address. The station with the highest station ID becomes the ring purger.

root

The bridge that serves as the root point of the logical spanning tree formed by the spanning tree computation process. The root originates the Hello message that is propagated through the network to maintain the spanning tree. The bridge with the lowest Root Priority parameter value and hardware address becomes the root.

Root Priority

A spanning tree parameter that determines a bridge's priority for becoming the root of the logical spanning tree. The Root Priority parameter value is used as a prefix to the bridge's address to form the bridge's identification; for example, 128/08-00-2B-2C-08-21.

S (physical port type)
A physical port on a station that connects to the M port on a wiring concentrator.

SA match frame strip mode
Source address match, a method of stripping frames from the FDDI ring where the station strips frames from the ring that contain its own address in the source address field. Wiring concentrators use the SA match frame strip mode.

selective address forwarding
A form of forwarding on a LAN Bridge 200 where the bridge forwards only frames with addresses that have a management entry set to FORWARD. Selective address forwarding is implemented on LAN Bridge 200 models by setting the Manual Filter software switch to True.

selective protocol forwarding
A form of forwarding where the bridge forwards only frames with protocol values that have a management entry set to FORWARD.

SIF
Status information frames, types of FDDI Station Management Protocol (SMT) request and response frames. The SIF Configuration response frame displays the configuration of the station, while the SIF Operation response frame shows its operational state.

Single Attachment Concentrator (SAC)
A concentrator that has only one attachment to the FDDI ring.

Single Attachment Station (SAS)
An FDDI station other than a wiring concentrator that has only one attachment to the FDDI ring.

SMT (Station Management)
The entity within an FDDI station that monitors station activity and exercises overall control of station activity. SMT allows remote monitoring and control of FDDI stations.

source address
The field in a frame that contains the address of the station from which the frame is being sent.

spanning tree
The logical topology created by bridges through the spanning tree computation process. The spanning tree connects all the segments while ensuring that there is only one path between any two stations.

spanning tree computation process
The process used by bridges in an extended LAN to configure themselves logically into a loop-free network where all segments are connected.

station
An addressable node on a LAN capable of transmitting, repeating, and receiving data. On an FDDI ring, a station has one SMT and at least one MAC, one PHY, and one PMD.

status
Dynamic information about a device, its lines, and its physical ports that you can display with the SHOW STATUS command.

Status Information Frame
See **SIF**.

token
A special frame that controls the right to transmit on the FDDI ring. Each node has a timer that controls how long the node can hold the token.

TVX
See **valid transmission time**.

update software switch
A software switch that enables or disables down-line loading of firmware upgrades to a DECbridge 500 or a DECconcentrator 500.

up-line dump
The process by which a failing device sends its memory and register contents across the network to an appropriately configured host. The up-line dump is then analyzed by Digital customer service to determine the cause of failure.

up-line dump host
A DECnet-VAX host that is configured with the Network Control Program (NCP) to receive device up-line dumps of memory and register contents.

Upstream Neighbor Address (UNA)
The 48-bit hardware address of the station that is on the upstream side of the FDDI ring from the station.

valid transmission time

The time set for an FDDI station's valid transmission timer, a timer that detects token loss on the ring, excessive noise, and other faults. (Valid transmission time is the ANSI FDDI parameter TVX.) The station resets its valid transmission timer to zero upon receipt of the ending delimiter of a valid frame or nonrestricted token. The timer expires when the time since the last valid transmission exceeds the TVX value set for the station.

wiring concentrator

An FDDI node that provides additional attachment points for stations that are not part of the dual ring, or for other concentrators in a tree structure. A concentrator has two or more Physical layer entities and may have one or more Data Link layer entities. The concentrator is the focal point of Digital's Dual Ring of Trees topology.

wiring concentrator state

The operational state of the wiring concentrator. Wiring concentrator states include INIT, BROKEN, and OPERATE.

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